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THE TURN OF THE YEAR

Well, old 1930 was not such a bad year after all, as far as the A. V. M. A. was concerned, in spite of the business depression, or economic dislocation, or whatever you choose to call it. As this is written, our records show that we issued 4137 membership cards for 1930, as against 4202 for 1929, up to the corresponding date one year ago, a decrease of less than 2 per cent. Receipts from dues and application fees for the year ending October 31, 1930, were about 3 per cent less than for the corresponding period of 1929, while receipts for the JOURNAL (subscriptions and advertising) were off about 6 per cent. A considerable part of the shrinkage resulted from the falling off in the number of applications received during 1930, as compared with our banner year 1929.

On the other hand, if we compare the results of the year 1930 with the average of the five years preceding, we find that the year just closed shows up very favorably, if a financial yardstick is used for measuring. But there are other ways of measuring the progress of an organization like the A. V. M. A. Attention has been directed to the fact that much of the work done by the Association is accomplished through committees, as well as through the efforts of individual members. In a large group such as we have in the A. V. M. A., with 4500 members, it does not

take much upon the part of each individual member to make the aggregate really amount to something. Therefore, it behooves each member to realize his responsibilities and bear his share of the load whenever he is called upon to help in some undertaking. It is this sort of team-work that has made it possible for the A. V. M. A. to go out and do things. The great big advantage of having 4500 veterinarians welded into one large organization lies in the fact that their efforts can be better coordinated and directed in all undertakings on a large scale.

The new year will undoubtedly bring its problems just as other years have in the past. The veterinary profession has no right to expect that it will not have its share of problems to face, just the same as other professions and other lines of business. Some of these problems can be anticipated; others can not. We can at least prepare for those that are in sight. By so doing we will be better prepared to face those that are around the corner. One way to command the respect of other groups is by showing a united front whenever the occasion demands. Sometimes such occasions arise when least expected. Preparedness is the word.

THE CURRICULUM OF THE VETERINARY COLLEGE

There is in all pedagogical fields an endless search for better curricula, better methods and better teachers, and this search goes on in the veterinary colleges as elsewhere. In part, this search is animated by the general desire for improvement, and in part by the special need for readjustment to meet new conditions.

The veterinary colleges are especially confronted by the need for readjustments. At the beginning of this century there was some ground for calling a veterinarian a "horse doctor." Today there are numerous veterinarians who would be embarrassed if confronted with the necessity of treating a case of azoturia or differentiating a case of swinging-leg lameness from a case of supporting-leg lameness. Some of these men know dog diseases, or tuberculosis, or hog cholera, or laboratory methods, but they do not know horses or the ailments of the horse.

It is inevitable that changes in the veterinary curriculum should lag behind the needs in practice. The personnel, equipment and housing of a school cannot be upset so easily that a school can make a rapid shift to meet an anticipated demand. Practically

speaking, the demand must come first. We are fortunate if we can meet a demand at a relatively early stage.

At the present time we can foresee certain demands and produce some reasons why we should now take steps to meet them. For one thing we can now face the proposition that whereas human medicine confines itself to the one patient—man, veterinary medicine must seriously consider preparing the student to take care of diseases of all other animals, or, to be conservative, of at least all other vertebrates. Within the past quarter-century the cow has forged ahead of the horse in importance as a patient; dogs and cats now have as much importance as horses, and swine are almost as important as horses. Sheep and poultry lag behind, largely through our neglect.

Now there is a growing need for veterinarians to take advantage of the rapidly growing opportunities in the fur-animal industry, and as far as our veterinary colleges fit their students for this work, the fur-farmer, as a rule, knows more about these animals than do the students. The veterinarian in practice who knows these animals and their diseases has learned them from experience, from reading and from what he has heard at veterinary meetings.

Another field which has opened up to a slight extent, and which will yet offer a fine field for practice, is in the control of diseases of wild animals, game birds and animals in zoological parks. The conservation movement in this country is still growing, and if our wild life is to be conserved it must be protected not only from pot-hunters but also from disease. On restricted ranges or in confinement our wild life will be more subject to certain diseases than it is in nature.

Obviously, if the veterinarian is to deal with all sorts of veterbrates as patients, he must learn something about the anatomy, physiology and pathology of these animals. For this purpose a course in comparative anatomy of vertebrates would be of much more value than the present intensive study of the anatomy of the horse. Anatomy will continue to be of value, but we must modify our treatment of the subject. For the purpose of surgery, we need more emphasis on regional anatomy and lesson anatomy by systems.

A further consideration of our needs indicates that we must meet an increasing demand for a knowledge of parasitology. Parasitism is something which is present to some extent in almost all animals in practically every place, every year and more or

less throughout the year. The treatment of parasitism makes up half of the practice of many small-animal practitioners, and much more than half in some cases. We have greatly improved our teaching of parasitology, but we must make more improvements and devote more time to postmortem, fecal and skin examinations.

If our practice is going to involve many more hosts—ruminant, carnivore and bird, and the many parasites—protozoon, fluke, tapeworm, nematode, insect and arachnid, we are forced to the conclusion that the veterinarian of the future must be a zoologist. If this is the case, zoology must receive more attention in the veterinary curriculum than it does. Whether it shall supplant an existing subject or come in the preparatory school remains to be seen.

In connection with this preparatory work, it may be noted that medical schools require two to four years of college work as preparation for the medical course. This preparatory work usually involves advanced work in zoology, something of value to the physician but which would be of more value to the veterinarian. Aside from such courses it is probable that the principal value of his college preparatory work to the physician is cultural. It doubtless does more to improve the social status of the physician than to improve his professional status. By and large, the veterinarian in practice is as efficient as the physician in practice, but the physician has a better social status. Social status is determined primarily by the personal qualities of the individual. If a veterinarian is excluded from certain social groups, it is rarely because he is a veterinarian; it usually is because of the presence or lack of some personal quality.

From the standpoint of the large field he has to cover, the veterinarian needs wide training. Where the physician's work is intensive, the veterinarian's is extensive. We cannot raise our requirements for education faster than the returns to the veterinarian in practice warrant, but we must make the adjustments in our curriculum that will better enable us to improve his status in practice by greater efficiency.

M. C. H.

PLAN NOW FOR KANSAS CITY

Acting upon the recommendation of the Local Committee on Arrangements for the Kansas City convention, the Executive Board, at a special meeting held in Chicago, last month, fixed

the dates for the convention—August 25-26-27-28. Now that both the time and the place of the 1931 convention have been definitely fixed, members may proceed with making their plans to attend what will probably be the largest convention of the A. V. M. A. ever held. At least, that is what the folks in Kansas City are already predicting.

The selection of dates for each annual convention is by no means an easy thing to do. Only those who have actually been concerned in selecting convention dates are in a position to know how many factors have to be taken into consideration. It is always a foregone conclusion that whatever dates are selected by the Executive Board, these will not suit everybody. Picking out the best time for each convention usually resolves itself into selecting dates that will be the most satisfactory for the largest possible number of those concerned.

In an effort to secure opinions concerning the most desirable time for holding the Kansas City convention, we wrote letters to approximately thirty prominent veterinarians located in different parts of the Central West. We considered every one of these thirty veterinarians as likely to attend the Kansas City meeting, and in each case we asked for an expression as to what would be the most desirable time in his opinion. Only about one-half of those written took the trouble to reply to our letters. To show how opinions vary, we will give a summary of the replies received.

Three members stated very emphatically that almost any time except during the month of August would be satisfactory. The same number indicated that any time during either July or August would be all right with them. Three members indicated that in their opinions August would be the best month for holding the convention. Two members gave their reasons for believing that either August or September would be a good time. Two members preferred some time during the month of September, and two others indicated October as the month of their choice. It will be seen, therefore, that of the fifteen veterinarians who took the trouble to reply to our letter, eight indicated that August would be satisfactory to them, and seven members indicated a preference for some month other than August.

The Local Committee on Arrangements has been organized under the leadership of Dr. A. T. Kinsley as General Chairman. Dr. Kinsley has had previous experience in this capacity and we can confidently look forward to the successful culmination of

plans under his efficient management. Quite a number of subcommittees have been appointed, with a well-known veterinarian heading each group. They are as follows:

Alumni Meetings—Dr. J. D. Thrower, Kansas City, Kans.
Army—Capt. J. A. MaCallam, Kansas City, Mo.
Banquet—Dr. J. L. Jones, Blackburn, Mo.
Clinic Lunch—Dr. F. A. Imler, Kansas City, Kans.
Clinics—Dr. S. L. Stewart, Olathe, Kans.
B. A. I.—Dr. J. S. Jenison, Kansas City, Kans.
Entertainment—Dr. J. C. Flynn, Kansas City, Mo.
Finances—Dr. H. E. Curry, Kansas City, Mo.
Hotels—Dr. Ashe Lockhart, Kansas City, Mo.
Parking Station—Dr. C. M. McFarland, Kansas City, Kans.
Press and Publicity—Dr. C. D. Folse, Kansas City, Kans.
Reception—Dr. F. H. Suits, Odessa, Mo.
Registration—Dr. E. R. Steel, Kansas City, Mo.
Transportation—Dr. G. G. Graham, Kansas City, Mo.

DR. ROBERT S. MACKELLAR
Chairman of the Executive Board.

APPLICATIONS FOR MEMBERSHIP

In the twelve issues of the JOURNAL published during 1930, we listed 252 applications for membership in the A. V. M. A. The year 1930 was the first year that failed to produce more new members than the previous year, since the present system for

handling applications went into effect, the latter part of 1924. Here are the figures:

1925	139
1926	233
1927	301
1928	462
1929	633
1930	252

It was a foregone conclusion that we could not go on increasing the number year after year, so 1930 turned out to be the year in which to make a new start. Looking at the situation from the standpoint of conditions as they existed generally during 1930, the addition of 252 new members to the roll does not make such a bad showing. With the 1931 convention scheduled for "The Heart of America," and with hundreds of non-members located within several hundred miles of the convention city, we should expect to see the number of applications received this year surpass the 1930 figure by a comfortable margin.

Remember the regulations governing the admission of new members. The following is quoted from the By-laws:

> Applications for membership shall be made upon blanks furnished by the Association, in the handwriting of the applicant, and must be endorsed by two members of the Association in good standing, one of whom must be a resident of the state, province or territory in which the applicant resides. Applications must be accompanied by a membership fee of $5.00 and dues pro rata for the balance of the fiscal year current, as stated on the application blank. Applications must be filed with the Secretary and examined by him for correctness and completeness as far as available information will allow. After such approval by the Secretary, the latter will cause to be published in the official JOURNAL, as soon thereafter as possible, said application with name and address of the applicant, college and year of graduation, and names of vouchers. If no objections shall be filed with the Secretary, as against the applicant being admitted to membership in the Association, his name shall again be listed in the next issue of the JOURNAL, and if no objections shall have been filed within thirty days after the second publication of the name of the applicant, he shall automatically become a member and shall be so enrolled by the Secretary and membership card issued. If any objections be filed against any applicant, either on first or second notice, said application will be referred to the Executive Board for consideration.

FIRST LISTING

APPELBERG, SAMUEL M. 526 Saw Mill River Rd., Yonkers, N. Y.
D. V. S., New York-American Veterinary College, 1913
Vouchers: Raymond J. Garbutt and J. Elliott Crawford.

CACERES, V. C., CAPT. ARMANDO RODRIGUEZ
Castillo de la Fuerza, Box 883, Havana, Cuba
D. M. V., University of Havana, 1912
Vouchers: Luis A. Beltran and H. Preston Hoskins.

DAVIS, CHARLES ROBERT Box 125, College Park, Md.
D. V. M., Alabama Polytechnic Institute, 1929
Vouchers: E. M. Pickens and C. A. Cary.

FERNANDEZ Y MALBERTY, ABELARDO
General Lee No. 6 A, Marianao, Havana, Cuba.
D. V. M., University of Havana, 1914
Vouchers: M. A. Emmerson and H. E. Bemis.

GRIFFIN, V. C., CAPT. WILL C. Fort Brown, Texas.
D. V. M., Kansas City Veterinary College, 1912
Vouchers: A. L. Mason and Wm. H. Houston.

HOEFLING, RAY 709 Euclid St., Austin, Minn.
D. V. M., Cincinnati Veterinary College, 1911
Vouchers: D. D. Tierney and E. B. Carter.

JONAS, SALO Rear 83 Broadway, New Haven, Conn.
Dr. Sc. Nat., University of Halle, 1925
B. V. Sc., Ontario Veterinary College, 1930
Vouchers: Charles E. Flaxman and Sol Shapera.

KESTER, BRUCE Vet. Clinic, Ohio State Univ., Columbus, Ohio.
D. V. M., Ohio State University, 1925
Vouchers: Leonard W. Goss and Walter R. Hobbs.

MUXLOW, THOMAS JEROME 320 S. 4th Ave., South Saint Paul, Minn.
D. V. M., Kansas State Agricultural College, 1930
Vouchers: G. E. Totten and M. E. Schwab.

RIEDE, PETER H. Mabel, Minn.
D. V. S., Kansas City Veterinary College, 1911
Vouchers: O. H. Titterud, F. C. Kochendorfer and H. C. H. Kernkamp.

RIFE, V. C., CAPT. GEORGE JACOB
Veterinary General Hospital, Manila, P. I.
D. V. M., Kansas City Veterinary College, 1916
Vouchers: J. H. Kintner and William P. Hill.

TAYLOR, REX 2500 16th St., San Francisco, Calif.
B. S., D. V. M., State College of Washington, 1930
Vouchers: Joseph M. Arburua and Geo. M. Simmons.

Applications Pending

SECOND LISTING

Cox, V. C., Capt. Claude Francis, Army Vet. School, Army Med. Center, Washington, D. C.
Dirstine, Jean H., 3100 D St., Eureka, Calif.
Harkins, Curtis I., 44 Post Office Bldg., Birmingham, Ala.
Moore, Thomas, 522 Federal Bldg., Toronto, Ont.
Nichols, Abner Z., Hillsdale, Mich.
Robson, Gail W., Mount Victory, Ohio.
Schroeder, Charles Robbins, Pearl River, N. Y.
Seifried, Oskar, 25 Edwards Place, Princeton, N. J.

The amount which should accompany an application filed this month is $10.00, which covers membership fee and dues to January 1, 1932, including subscription to the JOURNAL.

COMING VETERINARY MEETINGS

California State Veterinary Medical Association and University of California Veterinary Conference. University Farm, Davis, Calif. January 6-9, 1931. Dr. W. L. Curtis, Secretary, 1264 W. 2nd St., Los Angeles, Calif.

New York City, Veterinary Medical Association of. Academy of Medicine, 5th Ave. & 103rd St., New York, N. Y. January 7, 1931. Dr. John E. Crawford, Secretary, 708 Beach 19th St., Far Rockaway, Long Island, N. Y.

University of Pennsylvania, Conference of Veterinarians at. School of Veterinary Medicine, University of Pennsylvania, Philadelphia, Pa. January 7-8, 1931. Dr. H. E. Bemis, Dean, 39th St. & Woodland Ave., Philadelphia, Pa.

Ohio State Veterinary Medical Association. Neil House Hotel, Columbus, Ohio. January 7-8, 1931. Dr. R. E. Rebrassier, Secretary, Ohio State University, Columbus, Ohio.

South Dakota Veterinary Medical Association. Hotel Cataract, Sioux Falls, S. Dak. January 7-8, 1931. Dr. Geo. E. Melody, Secretary, Hoven, S. Dak.

Tulsa County Veterinary Association. Tulsa, Okla. January 8, 1931. Dr. J. M. Higgins, Secretary, 3305 E. 11th St., Tulsa, Okla.

Texas, State Veterinary Medical Association of. Kemp Hotel, Wichita Falls, Texas. January 12-13, 1931. Dr. D. Pearce, Secretary, Box 335, Leonard, Texas.

Intermountain Livestock Sanitary Association. Hotel Bigelow, Ogden, Utah. January 12-14, 1931. Dr. Cecil Elder, Secretary, University of Wyoming, Laramie, Wyo.

Kansas City Association of Veterinarians. Baltimore Hotel, Kansas City, Mo. January 13, 1931. Dr. H. J. Hearrington, Secretary, 1130 Franklin Ave., Lexington, Mo.

Chicago Veterinary Medical Association. Atlantic Hotel, Chicago, Ill. January 13, 1931. Dr. J. B. Jaffray, Secretary, 2956 Washington Blvd., Chicago, Ill.

Rhode Island Veterinary Medical Association. Narragansett Hotel, Providence, R. I. January 13, 1931. Dr. G. L. Salisbury, Secretary, Wickford, R. I.

New York State Veterinary College, Cornell University, Poultry Disease School. Ithaca, N. Y. January 13-14, 1931.

Wisconsin Veterinary Medical Association. Park Hotel, Madison, Wis. January 13-15, 1931. Dr. B. A. Beach, Secretary, University of Wisconsin, Madison, Wis.

Iowa Veterinary Medical Association. Fort Des Moines Hotel, Des Moines, Iowa. January 13-16, 1931. Dr. C. J. Scott, Secretary, Knoxville, Iowa.

Maine Veterinary Medical Association. Bangor, Me. January 14, 1931. Dr. L. E. Maddocks, Secretary, R. F. D. 2, Augusta, Me.

Southeastern Michigan Veterinary Medical Association. Detroit, Mich. January 14, 1931. Dr. H. Preston Hoskins, Secretary, 537 Book Bldg., Detroit, Mich.

Maryland State Veterinary Medical Association. Medical Hall, 1211 Cathedral St., Baltimore, Md. January 15, 1931. Dr. E. M. Pickens, Secretary, College Park, Md.

Minnesota State Veterinary Medical Association. Lowry Hotel, Saint Paul, Minn. January 15-16, 1931. Dr. C. P. Fitch, Secretary, University Farm, Saint Paul, Minn.

Cornell University, Annual Conference for Veterinarians at. Cornell University, Ithaca, N. Y. January 15-16, 1931. Dr. P. A. Fish, Dean, New York State Veterinary College, Ithaca, N. Y.

Oklahoma State Veterinary Medical Association. Skirvin Hotel, Oklahoma City, Okla. January 19-20, 1931. Dr. C. H. Fauks, Secretary, 1919 W. Ash St., Oklahoma City, Okla.

Southern States Veterinary Medical Association. Hotel Tutwiler, Birmingham, Ala. January 19-20, 1931. Dr. M. R. Blackstock, Secretary, 157 Hampton Ave., Spartanburg, S. C.

Virginia Polytechnic Institute, Conference for Graduate Veterinarians at. Virginia Polytechnic Institute, Blacksburg, Va. January 19-24, 1931. Dr. I. D. Wilson, Dept. Zool. & An. Path., Virginia Polytechnic Institute, Blacksburg, Va.

Indiana Veterinary Medical Association. Severin Hotel, Indianapolis, Ind. January 20-22, 1931. Dr. R. H. Boyd, Secretary, 1422 N. Capitol Ave., Indianapolis, Ind.

Missouri Veterinary Medical Association and University of Missouri Special Course for Graduate Veterinarians. University of Missouri, Columbia, Mo. January 20-23, 1931. Dr. J. D. Ray, Secretary, 400 New Centre Bldg., Kansas City, Mo.

Nevada State Veterinary Association. Reno, Nevada. January 21, 1931. Dr. Edward Records, Secretary, University of Nevada, Reno, Nevada.

Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. January 21, 1931. Dr. W. L. Curtis, Secretary, 1264 W. 2nd St., Los Angeles, Calif.

Kansas Veterinary Medical Association. Topeka, Kans. January 21-22, 1931. Dr. Chas. W. Bower, Secretary, 1128 Kansas Ave., Topeka, Kans.

Mississippi Veterinary Medical Association. Jackson, Miss. January 21-22, 1931. Dr. R. H. Stewart, Secretary, Indianola, Miss.

Southwestern Tuberculosis Conference. Jackson, Miss. January 21-22, 1931. Dr. H. L. Fry, Secretary, 3-4 War Memorial Bldg., Nashville, Tenn.

New Jersey, Veterinary Medical Association of. College of Agriculture, New Brunswick, N. J. January 21-22, 1931. Dr. E. R. Cushing, Secretary, 947 Prospect Ave., Plainfield, N. J.

Tennessee Veterinary Medical Association. Nashville, Tenn. January 21-22, 1931. Dr. A. C. Topmiller, Secretary, Box 238, Murfreesboro, Tenn.

Arkansas Veterinary Medical Association. Little Rock, Ark. January 23, 1931. Dr. W. C. Glockner, Secretary, 312 Gazette Bldg., Little Rock, Ark.

Michigan State College Short Course for Veterinarians. Michigan State College, East Lansing, Mich. January 26-30, 1931. Dr. Ward Giltner, Dean, Division of Veterinary Science, Michigan State College, East Lansing, Mich.

Keystone Veterinary Medical Association. Philadelphia, Pa. January 28, 1931. Dr. C. S. Rockwell, 5225 Spruce St., Philadelphia, Pa.

Connecticut Veterinary Medical Association. Hotel Garde, Hartford, Conn. February 4, 1931. Dr. E. H. Patchen, Secretary, 83 New Haven Ave., Milford, Conn.

Ohio State University, Short Course in Diseases of Poultry at. Ohio State University, Columbus, Ohio. February 9-13, 1931. Dr. Oscar V. Brumley, Dean, Ohio State University, Columbus, Ohio.

Illinois Veterinary Conference, University of. Urbana, Ill. February 10-11, 1931. Dr. Robert Graham, University of Illinois, Urbana, Ill.

Alabama Veterinary Medical Association and Short Course for Practitioners. Alabama Polytechnic Institute, Auburn, Ala. February 2-7, 1931. Dr. C. A. Cary, Secretary, Alabama Polytechnic Institute, Auburn, Ala.

Ohio State University, Conference of Veterinarians at. Ohio State University, Columbus, Ohio. March 18-20, 1931. Dr. Oscar V. Brumley, Dean, Ohio State University, Columbus, Ohio.

STATE BOARD EXAMINATION

Iowa State Board of Veterinary Medical Examiners. State Capitol Bldg., Des Moines, Iowa. January 12-13, 1931. Dr. Peter Malcolm, Chief, Division of Animal Industry, Dept. of Agriculture, State House, Des Moines, Iowa.

VETERINARY PROBLEMS ON FUR FARMS*

By J. E. SHILLINGER, *Washington, D. C.*

Biologist, Bureau of Biological Survey, United States Department of Agriculture

INTRODUCTION

The formative stage of every new industry offers many opportunities for charlatans to pose as specialists and to impose on the legitimate development of the business. The recent growth of fur-farming activities, along with the multitude of unusual problems arising, has left the door wide open for untrained individuals to sell their services and products to the detriment of fur-farmers and incidentally to our profession also.

Many of the common wild fur-bearers are now raised in captivity, and the fur-farming industry, representing a large financial investment, should bring veterinarians many professional calls. The entire value of fur-bearers is embodied in their coats of fur, and very slight irregularities in the health and hygiene of the animals have a pronounced effect on the appearance and worth of the pelts. With fur animals, as with domestic live stock, the concentration of large numbers of them on amall areas multiplies the spread of infections, and our profession should be prepared to handle the sanitary, parasite and disease-control problems. More than 100,000 silver foxes were sold at the public auctions in North America during the past year. Many pelts were shipped to Europe for sale, and many more live animals were taken from the United States and Canada to foreign countries for breeding purposes. It is estimated that in North America there are approximately 10,000 fur-farmers with investments in stock and equipment in excess of $50,000,000.

One of the common errors among fur-farmers, as well as among some veterinarians, is to regard the fox and the dog so closely related as to be subject to the same parasites and diseases and responsive to the same treatment. These animals belong to distinctly different genera of mammals, and while a few ailments are identical in both, their response to disease as well as treatments usually is very different.

*Presented at the sixty-seventh annual meeting of the American Veterinary Medical Association, Los Angeles, Calif., August 26-29, 1930.

Hygiene and Sanitary Measures

The inherent wild nature of most fur-bearers and their ability to burrow as well as climb make it necessary to construct very substantial pens for them when raised in captivity. With such equipment as is required for holding them, it is impracticable to move the pens to new locations when the soil becomes polluted with pathogenic organisms, as is frequently done with chicken-runs, pig-pens and dog-yards. Hence, the problem of sanitation on fur-farms is given increased importance, not alone through the inconvenience of moving the inclosures, but also by reason of the fact that the transfer of most of these animals from the wild state to domestic environment appears to make them highly susceptible to pathogenic infections. Thus the selection of a ranch site should be made only after considering the various possibilities with respect to the ease of keeping it sanitary.

Well-drained soil is necessary, and if it is of a sandy or gravelly nature, rapid drying out is facilitated. A good plan followed by many fur-farmers is to remove a few inches of top soil periodically and replace it with fresh, uncontaminated earth. Water should not drain from one pen to another, and if a space of several feet is left between the pens the chance of spreading infection is lessened. It is absolutely necessary to have the pens separated far enough to make it impossible for the animals to reach one another's feet when they are extended through the meshes of the wire. Severe lacerations and broken bones result from a neglect of this precaution. A veterinarian should also be able to advise on the proper construction of kennels or nest-boxes. For foxes it is highly important to have the kennels so arranged that they can be taken apart for cleaning, and yet so constructed, with double walls and a dead-air space, as to maintain a uniform temperature for the young pups. Drafts and dampness must be kept out of the nest-boxes of all fur animals, especially when young are in them. Nest-boxes for minks especially must be dry and sanitary and free from drafts. For the sake of economy as well as cleanliness, it is well to have rabbit-hutches constructed on the self-cleaning design.

One of the vices encountered on fur-farms is that of the mother moving the young. For reasons frequently of an obscure nature, the female sometimes takes the young from the nest-box and carries them about the pen. This habit may be persisted in constantly, or at intervals, until the offspring are killed by the process or die from injuries and exposure. In some instances the

offending parent may be broken of the practice by a study of local conditions. Damp or drafty nest-boxes are sometimes responsible. At other times outside disturbances, such as noisy machinery, vehicles, airplanes, or other animals near the nest, may be the exciting cause. In many instances a faulty diet is evidently responsible for rabbits killing their young. When no definite reason for these acts can be determined nor the vice rectified, and the mother persists in the practice, the owner should be advised to dispose of her and the place given to an individual of greater promise. A device adopted on some fox-farms to offset the harm done by females carrying their pups out of the kennels and leaving them on the cold or wet ground is to construct two kennels in the pen. The mother then will often move them from one nest-box to the other without seriously injuring them.

Pathological Conditions

Since fur animals appear to be particularly susceptible to septicemic and pyogenic infections, it is especially important that a veterinarian be called for even minor operations. Deaths as a result of septicemia are common among fur animals, and valuable pelts are seriously injured from extensive abscesses following even such routine procedures as hypodermic injections. Slight external wounds should receive skillful attention, for the skin of the fur animal is of great importance, and any condition causing a blemish to either fur or skin lessens the worth of the animal in proportion to the extent of the injury.

Fur animals frequently manifest nervous symptoms, but in many cases these are of a secondary nature, likely resulting from erroneous feeding methods or unsuitable environment. As far as known, fox encephalitis is the only disease directly affecting the nervous system and causing definite pathology in it. The acutely sensitive nervous system of most fur animals is such as to make them respond to rather slight irregularities.

Parasitic Diseases

The external parasites of foxes are closely related, in nature, action, and their response to treatment, to those of the dog. Ear-mites and fleas are common, and both are controllable by means of the milder methods of treatment used for other small animals. It is important that the mild forms of parasiticides be applied to fur animals, as their tolerance for many drugs is much less than that of the average domestic small animal.

Ear-mites are common on fox- and rabbit-farms. Control measures are comparatively simple, and the pests may be eradicated completely with a few treatments if given to all the animals at the same time. Extensive flea infestations frequently occur on fox-farms and the usual treatments used for dogs may be applied.

Foxes are frequently affected with lungworms, which do considerable harm to the host. Medication is of no recognized value for this condition. The mature forms of these worms lodged in the trachea may be removed by means of a swab or brush specially designed for that purpose. This operation has been done successfully by some laymen, but its failure at the hands of many others indicates that it should be attempted only by those with special training in comparative anatomy and physiology, such as is had by veterinarians. The veterinarian, whose education acquaints him with the mode of infection with lungworms, also can give helpful advice on preventing infection from these parasites. Removing the animals to new, dry quarters or keeping them on wire-mesh floors, where all their waste products will fall through and leave no source of contamination, often effects a cure of mild cases without treatment, as well as prevents the trouble in normal foxes. While speaking of wire-mesh floors, I will mention here that in the commercial production of rabbits this form of hutch construction, viz., that of woven-wire floors, is very essential to the control of coccidiosis.

Hookworms and ascarid problems among foxes are not particularly unlike those among dogs. It has been found that the same methods of treatment are effective in both animals. In the light of our present knowledge, it is impossible to maintain a ranch entirely free from those nematodes once they are introduced. Ascarid infestation is so prevalent on most fox-farms that it is frequently the practice to administer several treatments at intervals of about two weeks to the fox pups during the first two or three months of their life.

Infectious Diseases

Little has been developed of practical importance with reference to the infectious diseases of foxes in the past year. It has been definitely demonstrated that encephalitis in foxes and distemper in dogs are caused by different viruses. Symptoms with varying degrees of severity occur when attempts are made at cross-transmission of these diseases, but there are evident differ-

ences in the nature of the infections in the respective animals. As yet, biological products for preventing fox encephalitis have not been developed to a point where their general use is recommended.

Paratyphoid infections, occurring sporadically in widely separated parts of the country, may generally be controlled by the use of an autogenous vaccine.

Other diseases not hitherto described, and as yet not thoroughly understood, have made their appearance recently on farms in the central and western states. In many cases it is difficult to ascertain whether the abnormalities are caused by definitely infectious pathogenic microörganisms or are the result of massive parasitic infestation, unsuitable rations, deficient nutrition, or general unhygienic surroundings. When a diagnosis of an outbreak of disease on a fur-farm is being made, it is advisable first to inquire into the feeding processes.

Nutrition

An error in nutrition encountered on fur-farms is that of a deficiency of the necessary mineral matter and vitamins. In the case of the carnivores, approximately 50 per cent of the ration should be made up of raw ground meat. Practically all parts of the carcass of a meat animal may be utilized for feeding. The meat should be ground before feeding and mixed with finely ground green bone, which supples two principal elements—the calcium and phosphorus so essential to the proper growth of pups. The gland tissues of animals slaughtered for feeding are rich in certain vitamins and should always be used in the diet. On account of the excessive fat, pork is not relished by foxes and minks. Chicken and waste products from chicken slaughterhouses are extensively utilized for fur-animal feeding. Fish and fish products may be used as a substitute for part of the meat ration. Blue foxes and minks appear to make better use of fish than do silver foxes.

Conclusion

The many new and unknown factors encountered in the business of fur-farming have brought into use a great variety of proprietary products both for feeding fur-bearing animals and treating them for disease. An astonishingly large proportion of these are either worthless or injurious. Practically all are harmful, because they give the users a false sense of protection against loss and preclude their employment of scientific methods.

While the fundamental rules for the treatment of fur animals are similar to those for domestic live stock, the characteristics of these animals require certain modifications in methods. These depend on the diseases involved, differences in their response to drugs, methods of restraint, and environment. It must be borne in mind that the temperature, pulse, and respiratory symptoms of disease in most fur animals are very misleading when compared with those of the more usual type of patient in veterinary practice.

Unfortunately there is still considerable exploitation in fur animals for breeding purposes, and in many cases the prices asked for them is out of proportion to their actual worth. But even after the inflated prices are reduced to a sound production basis, there is sufficient value in them to justify high-class veterinary services. Even with the financial depression of the past winter, the top price of a silver-fox pelt at auction in this country was $650, while many brought several hundred dollars each. The severe losses in the young stock and failure of reproduction among many of the adult animals have kept the values up. Through the aid of capable veterinary practitioners on fur-farms the number of young raised to maturity could undoubtedly be almost doubled and the average quality of the pelts raised to a higher standard.

Discussion

Dr. E. A. Bruce: Have you had any trouble with convulsive fits in mink at mating time?

Dr. Shillinger: Yes, we have. On account of the very highly nervous make-up of these fur animals in captivity, they will go into convulsions at the slightest provocation.

Dr. Bruce: Chiefly the mink?

Dr. Shillinger: Yes. I don't want to say this definitely, but it appears generally to be the result of too much cereal in the diet rather than sufficient meat. There is a tendency, on the part of many people going into the fur-animal industry, to try to make herbivorous animals out of carnivores because it is a cheaper type of food. We believe that fox and mink should have a diet consisting of at least 50 per cent fresh raw ground meat.

Dr. Bruce: Are some of these cases fatal?

Dr. Shillinger: Yes, perhaps the same proportion as in the case of running fits in dogs.

Dr. A. J. Ronsse: How do these fox tolerate that bread ration?

Dr. Shillinger: The bread that you saw in the picture forms a very easily procurable source of the cereal portion of their ration, but we never advise putting in more than at most 45 per cent of cereals, mixed in with the raw ground meat.

The kiln-dried or stale, dried bread is very useful as a cereal portion of the ration. Some fur-farmers use a home-made bread of certain amount of corn meal and wheat flour, shorts and bran, but in most places you can get stale bread from bakers, grocery stores, and so forth, at prices cheaper than you can afford to make it up yourself.

Dr. T. I. Means: Are there any successful beaver farms?

DR. SHILLINGER: Quite a few attempts are being made to raise beavers in captivity, but so far they have not had a very high rate of production. Beavers multiply rather slowly at best and their breeding habits have not been studied. There are many features about beaver-farming that require further investigation before we can advise on it. The methods of feeding beavers require considerable attention. Suitable types of food are procurable in most of the northern states where beavers occur in nature, but this is usually supplemented, when they are kept in pens, with certain roots, such as turnips.

DR. A. A. HERMANN: I would like to describe some of the symptoms and autopsy lesions found in fox puppies and get a tentative diagnosis: First, of all, on examination, extremely high temperature, rapid loss of flesh, and a weakness in the animal, causing it to wobble, intense dysentery, with the temperature running fom 105 to 109° F., some pneumonia and a slight discharge, principally from the eyes, with some from the nose. On autopsy, lobar pneumonia, enlargement of the spleen to triple the normal size, some spots on the kidneys, and all of the symptoms of enteritis; erosions close to the stomach but no intestinal parasites.

DR. SHILLINGER: Those symptoms are frequently found in the disease we call paratyphoid infection. We have found a loss of flesh and these symptoms following, or accompanying, paratyphoid infection on fox-farms.

DR. HERMANN: The patients seem to respond very well to a diet of cottage cheese and homologous anti-canine distemper serum.

DR. SHILLINGER: Paratyphoid has responded very well to autogenous vaccines. Apparently there are several different strains of paratyphoid organisms affecting the fox and they do not seem to cross-immunize very well, one against the other, much the same as the paratyphoid A and the paratyphoid B in the human vaccination against typhoid.

DR. BRUCE: As an example of the effectiveness of vaccine, perhaps a little outbreak that occurred year before last, in British Columbia, may be interesting. There were 180 foxes on this particular farm and 120 were ill. At the time I got some specimens, eight had died. I made a vaccine from a paratyphoid organism and after that only one more animal died. At the time they were vaccinated, 120 were ill.

Ohio Offers Another Course in Poultry Diseases

The College of Veterinary Medicine, Ohio State University, will offer another short course in diseases of poultry to graduate veterinarians, February 9, 10, 11, 12, 13, 1931. The response to the course offered in October, 1930, was so enthusiastic and the numbers so large that it has been decided to repeat the course in order to assist those who were unable to attend on those dates.

The program for each morning will consist of lectures on the more important conditions affecting poultry. The afternoon sessions will be devoted entirely to laboratory work, including demonstrations, dissections, agglutination tests, identification of parasites and parasite ova, and portmortem examinations. On Friday afternoon an interesting and instructive poultry clinic will be held.

The enrollment for this course will necessarily be limited. Application cards will be mailed from the office of Dean Brumley in ample time for registration, and registrants will be accepted in the order in which their applications are received.

SOME NOTES ON LIVER-FLUKE INVESTIGATIONS*

By J. N. SHAW, *Corvallis, Oregon*

Department of Veterinary Medicine, Oregon Agricultural College,

INTRODUCTION

It is the purpose of this paper to deal with the liver-fluke problem only in a very general way, and possibly to cover some phases in a manner not covered before. Veterinarians living on the Pacific slope do not need to be told about the importance of this parasite, and I believe there has been brought to the attention of the profession the ways in which this problem might involve the live stock of the entire United States. Only recently the English have become alarmed at the finding of what is possibly *Fasciola magna* in cattle imported into England from Canada. It seems entirely probable that *Fasciola hepatica* was imported into the United States and became established here.

LIFE HISTORY

In studying the life history, only a few points of interest can be brought out. One is interested in knowing that fluke eggs are capable of lying dormant for long periods of time, even when under conditions apparently favorable for hatching. Eggs have been known to hatch over a period of 13 months. This means that eggs deposited now are capable of hatching and infesting snails a year from now.

Eggs are not always easily found in feces. Flotation methods used to concentrate other parasite eggs do not serve for fluke eggs because increasing the specific gravity of solutions so used causes the collapse of parasite eggs that are thin-shelled or the opening of the opercula in operculate shells. Five per cent acetic acid and equal parts of ether serve very well for examination for fluke eggs, especially in feces from carnivores. For routine diagnosis, smears examined under a low-power dissecting scope give satisfaction.

Embryos from hatching eggs show a decided preference for certain snails, but have been seen to attack two different genera and five different species. Three of these species have been proven to be definite hosts of the parasite in this country.

*Presented at the sixty-seventh annual meeting of the American Veterinary Medical Association, Los Angeles, Calif., August 26-29, 1930.

Snail Hosts for Fasciola Hepatica

In North America the following snails have been proven to be intermediate hosts for *Fasciola hepatica: Lymnaea* (*Galba*) *bulimoides* Lea., *L.* (*G.*) *bulimoides techella* Halderman, and *L.* (*G.*) *ferruginea* Halderman. In Porto Rico *L.* (*G.*) *cubensis* (Pfeiffer) has been incriminated; this species exists also in Florida, Georgia, Louisiana, Texas, Mexico and Lower California.

Looking over the distribution of snails that might act as hosts for the liver fluke, we find members of the family Lymnaeidae in every state in the Union. It is a known fact that the parasite has made use of these hosts in the parts of the country where climatic conditions are most favorable to its existence. Is it not possible that we can look for a spread of this parasite to the entire United States? If so, then it becomes a problem with which all veterinarians should be concerned.

F. C. Baker describes 103 species of Lymnaea in North America. With such a large number of species so widely distributed, it is readily understood that they are found living under a variety of conditions. About the only things necessary to their existence are food, air and moisture. Lymnaeas have been found at extremely high altitudes. Some species are capable of withstanding quite long droughts, but in spite of their ability to exist under varied conditions some species are most difficult to raise in aquaria.

In collecting specimens as possible hosts, it is well to keep in mind a few things in regard to their identification. The following conchologists are recognized as authorities in their field:

Dr. H. A. Pilsbry, Academy of Natural Science, Philadelphia, Pa.

Dr. W. B. Marshall, U. S. National Museum, Washington, D. C.

Dr. G. Dallas Hanna, Academy of Natural Sciences, San Francisco, Cal.

Mr. W. J. Clench, Museum of Comparative Zoology, Harvard University, Cambridge, Mass.

Shells of snails to be identified should be cleaned thoroughly with a fine brush. Unless the animals are preserved with some material such as alcohol, the soft body parts should be removed. Snails are easily removed from their shells after they have been immersed in boiling 70 per cent alcohol. The animal can be picked out with a pin or teasing-needle. Shells to be shipped can be packed in vials protected by cotton. Live specimens can

be shipped and will travel weeks in such a state if packed in wet moss or mud in such a way that oxygen can be obtained. If specimens are to be sent in for identification, it is preferable to send live specimens, as this gives the conchologist a chance to study animal, jaw, radula and genitalia. Attempts at identifications from shells alone have resulted in much confusion as to species. Variations in shells of some species seem to be quite common.

One way to detect parasitic infestation of snails is to kill the snails by immersing in boiling 70 per cent alcohol and then examine them. This, of course, kills the parasites as well as the snails, but it does not destroy the size, shape, color and anatomy of the infesting organisms. *Fasciola hepatica* is generally found in the liver of the snail, also known as the digestive gland, which occupies the tip of the spire. It is yellow in color and large enough so that it fills the last two whorls of the shell. The parasites are milk-white when mature and if a snail is thoroughly infested, placing the removed body in a watch-glass containing a small amount of water will generally liberate some parasites from the liver. If they are not apparent in this manner, dissection of the liver with a pin will disclose whether or not the organ is infested.

In the field one can detect infestation by the removal of the body of the live snail from the shell. This is done by applying fine thumb-forceps to a little more than half of the body whorl (the largest whorl). Then the snail is grasped with the forceps immediately posterior to the head and foot. Gentle traction usually will result in the entire snail coming free from the shell. The milk-white appearance of the parasites makes them apparent immediately if the snail is grossly infested, and immersion in a small amount of water in a watch-glass will result in the liberation of cercariae that can be seen without the aid of a microscope. If one is examining snails for percentage of infestation, it is best to gather a large number of snails, kill them as described above, and determine the infestation by removal and examination under a dissecting microscope.

Rediae and Cercariae

The Lymnaeas that act as hosts for *Fasciola hepatica* are very apt to be infested with other fluke forms. In one state five different cercariae have been found in one species. These particular forms were markedly different from *Fasciola hepatica*, but

these differences were not so apparent to the author until after he had opportunity to study forms of Fasciola. Some of the other cercariae existed in sporocysts only and were found in the liver of the snail and these other cercariae were much smaller than those of Fasciola, had shorter tails, were armed (having a stylet near or in the ventral oral sucker) and were not milk-white. The sporocysts did not have definite organs similar to the rediae of Fasciola; they were not so different in size or color but differed in other respects. After one has had an opportunity to see the rediae and cercariae of Fasciola there would be no danger of confusion. With one exception, the other cercariae found in the Lymnaeas by the author have not encysted. This fact was very useful in helping to differentiate them.

Immature rediae have the power of locomotion, but it seems to be lost when cercariae are developed enough for discharge. The movement is very slow, but sufficient to be noticed.

Many workers have described the above forms, so one need not want for literature, but in spite of the abundance of literature there is nothing that helps like the actual seeing of the live forms in action. Dr. Montgomerie reported that their problem in Wales was much simplified because apparently only one fluke was commonly met with in the Lymnaeas there.

Symptoms and Lesions

One need not say much about the symptoms and lesions because these two subjects have been quite thoroughly covered by many others. I would only add that it is not an easy matter to diagnose this disease by symptoms alone and one can even be mistaken when one or two autopsies have been made. Too much importance can not be placed upon the finding of the parasite eggs in the droppings of affected animals. So much popular literature has been published on symptoms that sheep men generally imagine themselves capable of diagnosis, and it is pitiful the mistakes that are being made.

Lesions of fluke infestation vary with the age and number of invading parasites. It is often necessary to use a microscope in finding the parasites responsible for the disease. Where parasites are numerous, lesions are generally quite gross, but numerous parasites are not necessary for destruction of life. This has led to the belief that secondary invaders are responsible for deaths in some cases. This seems to be definitely proven by the British,

but so far in this country secondary invading organisms have not been incriminated experimentally.

Treatment

One-cc capsules of carbon tetrachlorid will destroy mature parasites and parasites just before they have deposited eggs. This treatment must be given at such times as such parasites can be determined to be present in the liver. If it is proven the sheep are dying of infestation with immature parasites, then a larger dose (5 cc) should be used.

In treating such animals it is well to be conservative. Try it on a few and wait 4 or 5 days to note effect. The reputation of the treatment has suffered as a result of its injudicious use. The destruction of an entire flock or a large percentage of such a flock is almost inexcusable. Certainly the owner can not be blamed for destroyed faith and the veterinarian must remember that he is responsible. The sensitivity to carbon tetrachlorid can be determined. Just what causes it no one knows, apparently. In one flock fed entirely on alfalfa hay, pregnant ewes of several ages were treated. Only the 3-year-olds showed any susceptibility to the chemical. Should we interpret this as an indication of calcium deficiency? It would seem that infestation might have something to do with this susceptibility. The question is often asked should we treat ewes well advanced in pregnancy? I have seen losses stop almost over night in a flock on lambing-beds following treatment. Most certainly it would seem advisable to try treatment if losses were due to fluke infestation regardless of the age or condition of the affected animals.

Control

Copper sulphate does destroy snails. It is both cheap and easily applied. It is thought that the best time to treat snail-infested lands has not been definitely determined as yet. There seems to be a difference of opinion as to when snails are most numerous, but it quite probable that more snails could be destroyed in early summer than almost any other time of year. This would be because several generations would be present on places to be treated and such areas could be more easily determined.

One phase of control work that has received little attention in this country in connection with the parasite is the possibility of snail destruction by insects parasitic on the snail. In Japan one of the intermediate hosts of the blood fluke, *Schistosoma*

japonicum, is destroyed by a species of fire-fly. We have fire-flies in this country, but not the same species as is found in Japan.

Cost of Pasture Treatment

Finely ground bluestone or copper sulphate can be obtained from most of the concerns handling orchard sprays for about 10 cents per pound. Because it is finely ground, it goes into solution readily and is easily mixed with other substances with which it might be broadcast. Mixing with calcium sulphate or gypsum works very well. Gypsum is quite light and outlines areas treated. This is important because it aids in even distribution of copper sulphate. Grass treated with this chemical in quantities sufficient to destroy snails is not poisonous to live stock. This might not be true if animals were forced to drink water from treated areas. The British recommend that stock be kept from treated pastures for several days after treatment.

It should be kept in mind that this paper is only an effort to clear up some of the points that were not clear when the author started work on this problem. The points covered above might be taken merely as suggestions for others interested in the same field.

The following references have been found very useful:

Lymnaeidae of North and Middle America, by Frank Collins Baker, Chicago Academy of Sciences.

Fresh-water Biology, by Ward and Whipple.

The Microtomist's Vade-Mecum, by Bolles Lee.

Discussion

Dr. Robert Jay: We feel that we are greatly indebted to Dr. Shaw for his contribution to the bionomics of the liver fluke.

With the exception of the assistance given Dr. Sinitsin in his research into the life history of the liver fluke in California, my part in fluke control has been to make practical application of the knowledge imparted by these scientists. The losses which had been sustained by the sheep-owners in certain parts of this state due to liver flukes were enormous. When Dr. Hall announced his intention of directing control measures in California, the news was received with enthusiasm. To the hope of relief from these losses we owe the splendid cooperation of the sheep-owners and the success of our efforts.

We employed two means of control in our campaign, namely, the treatment of the infested sheep with carbon tetrachlorid for the removal of the flukes in the bile-ducts and the destruction of the snail hosts of certain intermediate stages of the fluke, by means of copper sulphate. Treatment of animals with carbon tetrachlorid we found to be very effective but it has its hazard. Luckily the danger was not realized at the inception of the project. Had it been, there would have been some hesitancy in its indiscriminate use. Some 200,000 doses were administered to sheep while on native pastures without detecting untoward effects. However, when pastures became sparse and the sheep lost condition, many were taken up and either hand-fed or turned onto cultivated crops. A few bands were retreated after the change of feeds.

It was then we learned of the possible injury to sheep by the use of the drug. Sheep which had been treated twice without evidence of injury while on the native pastures when again treated after changing to alfalfa pastures, or hand-fed barley and native hay, became decidedly sick by the following morning.

The sheep appeared rooted to the ground, disinclined to move, with twitching of the muscles of the face and neck, some down with head turned on the shoulder, very much the picture of a cow with parturient paresis. Deaths usually occurred within forty-eight hours after treatment; some died the following day. There were actual deaths of from 3 to 10 per cent of the treated lots. The sheep surviving remained off feed for about a week but seemed to make full recovery. The alarm caused by the distress and losses had a distinct inhibitory effect in the treatment of sheep

Dr. Minot, who had conducted experiments with parathyroidectomized dogs, recognized the similarity of symptoms displayed by dogs on experiment with carbon tetrachlorid. The symptoms were those of calcium tetany. It was found that the feeding of calcium lactate, or a diet containing bones, protected dogs from injury by the drug. It was also demonstrated that dogs in tetany following administration of carbon tetrachlorid which had not been properly prepared by diet containing some form of calcium, were relieved by the intravenous administration of calcium chlorid.

The inference was that protection against untoward effects of carbon tetrachlorid was in building up a calcium reserve. To this end we advocated the feeding of sheep with calcium carbonate with the common salt or, when hand-fed, to mix the calcium in the feed. Under this regimen the following year we had two more instances of tetany following. It was evident that the alfalfa pasture did not protect, nor the calcium supplement to the feed.

Dr. Shaw suggested that perhaps the livers were rendered more vulnerable to the action of the drug by destruction of tissue due to the presence of flukes. The autopsies in the sheep killed by the action of carbon tetrachlorid did not show flukes nor liver-rot as they had been treated twice before. The flukes were gone and the livers healed.

Again, an owner who had lost his sheep in previous years with fluke and had quit sheep-raising bought more sheep and went back into the business. He treated sheep bought as a precaution without a history of exposure to fluke. His losses were 10 per cent of the sheep treated, while the livers showed no infestation and no previous liver injury by fluke. We therefore infer that it is not the destruction of liver tissue due to fluke that accounts for vulnerability of the livers to carbon tetrachlorid, but to some other unaccountable predisposition to injury by the drug, brought about by the change of feeds resulting in increased thrift of the sheep. We now recommend that unless sheep are on a depleting ration, the sheep be turned into sparse pastures or fed roughage exclusively, for a few days previous to treatment and for a few days following.

Our experience in treating pregnant ewes conforms to the observations of Dr. Shaw. He have treated ewes far advanced in pregnancy. One band was lambing at the time of treatment, yet we did not notice any ill effects.

Copper sulphate has been found to be very effective in the destruction of snails. Ross and McKay, of Australia, found, in laboratory experiments, that a dilution of 1 part copper sulphate to 1,000,000 parts of water killed the snails in 35 minutes. A dilution of 1 to 150,000,000 killed all snails overnight. The adequate treatment of waters with copper sulphate is not always an easy matter. When a stream or streams originate on a ranch and the waters are confined within the banks we have placed sacks of the copper salt in the headwaters and in that way treat the water that flows from the sacks. If treated while the waters are receding after rains, the method was found to have killed the snails. When streams flow onto lands, an attempt may be made to have the owners cooperate in the application of the copper sulphate. If not, the owner can broadcast the powdered drug along the banks.

The streams should be followed along the banks and all wet places, overflows and back waters should be treated by broadcasting. Marshy areas can be successfully treated by broadcasting. When practical, such areas should be drained. Areas which are flooded during the winter and spring rains and dry up later in the season are often infective. The cysts that are deposited infest after the lands become dry. When lands are in the path of water-sheds, the volume of water is such that treatment is impractical. If such lands are productive and can be used for cultivated crops, we advise their use for the purpose. It is evident that methods must vary in accordance with the lay of the land and the volume of water to be treated. It is sometimes quite a

problem and taxes one's ingenuity. After a treatment, it is well to inspect the waters and wet places for live snails and, if found, retreat. Usually one thorough treatment suffices for the season.

No safe, practical treatment for the removal of flukes from cattle has yet been found. We place dependence for the control of flukes in the destruction of the snail hosts. Cattlemen are slow in adopting control measures for the reason that actual deaths in older cattle from fluke injury are rare. We have instances of deaths reported in calves due to liver-rot. However, owners have fed cattle during the winter months that failed to gain and were found infested with fluke upon slaughter. They reported a heavy loss from the feed wasted.

BUREAU TRANSFERS

Dr. John Redmond (Ind. '13) from Pascagoula, Miss., to Titusville, Fla., on tuberculosis eradication.

Dr. Herbert M. Smith (Harv. '86) from Providence, R. I., to Saint Albans, Vt., on meat inspection.

Dr. D. D. Tierney (McK. '08) from Chicago, Ill., to Austin, Minn., on meat inspection.

Dr. Paul C. Underwood (Ont. '26) from Chicago, Ill., on meat inspection, to Washington, D. C., in the Zoological Division.

Dr. H. W. Willis (Colo. '12) from Little Rock, Ark., on hog cholera control and swine sanitation, to Monticello, Fla.

Dr. Millard M. Woods (U. S. C. V. S. '18) from West Fargo, N. D., to New York City, on meat inspection.

Dr. Guy M. Parrish (A. P. I. '15) from Newark, N. J., to Cincinnati, Ohio, on meat inspection.

Dr. James E. Ewers (K. C. V. C. '10) from Sacramento, Calif., to Oklahoma City, Okla., on tuberculosis eradication.

Dr. Rudolph Snyder (Chi. '03) from Sacramento, Calif., to Denver, Colo., in charge of field inspection.

Dr. E. D. Kennedy (K. C. V. C. '06) from Spokane, Wash., to Los Angeles, Calif., in charge of meat inspection.

Dr. Theo. Schondau (U. S. C. V. S. '10) from Baltimore, Md., to Halethorpe, Md., on tuberculosis eradication.

Dr. Ray O. Porter (K. C. V. C. '09) from Edmond, Okla., to Jefferson City, Mo., on tuberculosis eradication.

Dr. C. L. Hall (U. S. C. V. S. '10) from South Saint Paul, Minn., to Huron, S. Dak., in charge of meat inspection.

Dr. Guy C. Juday (Chi. '14) from Chicago, Ill., to Piqua, Ohio, on meat inspection.

Dr. Chalmer W. Chapin (Chi. '15), from Laurel, Miss., to National Stock Yards, Ill., on meat inspection.

Dr. Henry Singleton (K. C. V. C. '06) from Houston, Texas, to Montgomery, Ala., in charge of meat inspection.

Dr. Hilborn H. Groat (K. S. A. C. '21) from Chicago, Ill., to Topeka, Kans., on meat inspection.

Dr. H. Tornow (K. C. V. C. '09) from East Saint Louis, Ill., to Zionsville, Ind., on virus-serum control.

Dr. W. E. Howe (Corn. '97) from Denver, Colo., to Sacramento, Calif., in charge of field inspection.

Dr. H. B. Raffensperger (Chi. '09) from Miles City, Mont., to Moultrie, Ga., on parasitological investigations.

Dr. Roy Avant (A. P. I. '16) from Birmingham, Ala., to Atlanta, Ga., on meat inspection.

Dr. Clifton Carter (K. C. V. C. '08) from Reno, Nev., to Dalhart, Texas.

Dr. W. W. Shartle (Ind. '09) from Monroe, La., to Baltimore, Md.

SALMONELLA ENTERITIDIS INFECTION IN GUINEA PIGS AND RABBITS*

By R. C. DUTHIE *and* CHAS. A. MITCHELL

Animal Diseases Research Institute,

Ottawa, Canada

With rare exceptions, all guinea pigs, rabbits, rats, mice and chickens used for experimental purposes at this laboratory are bred and raised on the premises.

For several years past it has been the daily routine practice of the Officer-in-Charge of these normal stocks of small laboratory animals to investigate all deaths occurring in the animal breeding-houses and pens and to make a necropsy report in every case. This has been done for the purpose of studying the natural diseases of these animals and to eliminate the possibility of natural or spontaneous tuberculosis as a factor in our experimental studies of this disease.

This report covers the fiscal year ending March 31, 1930, and deals solely with a disease encountered in stock guinea pigs and rabbits—a form of pseudotuberculosis, in which lesions occur not unlike the lesions produced in certain forms of tuberculous infection in these animals.

OCCURRENCE AND PREVALENCE

This disease was first noted early in 1929 and has been present in an enzootic form throughout the year, reaching its peak with 15 deaths in July and November, respectively, and 13 in February, or 101 cases in all. The stock guinea pigs, averaging about 900, are confined to cages and pens of 10 to 20 and deaths occurred here and there without sequence and without evidence of direct transmission from one to another. Deaths occurred in all age groups but mainly in the breeding females (21) and unweaned young (52) and accounted for 9.65 per cent of all cage deaths occurring in stock guinea pigs.

In rabbits the disease occurred in one pen of 15 half-grown bucks and accounted for 6 deaths in the space of a week, after which the outbreak subsided abruptly.

*Presented at the sixty-seventh annual meeting of the American Veterinary Medical Association, Los Angeles, Calif., August 26-29, 1930.

Anatomical Changes

The most constant lesion encountered in guinea pigs and the one that led to a tentative diagnosis of pseudotuberculosis was found in the spleen. In typical cases the spleen or liver, usually both, were studded with foci varying in size from minute white points, barely discernible, to yellowish white or whitish yellow nodules projecting above the surface and measuring several millimeters in diameter. Focal changes were found in the depths of the tissue as well as on the surface. In addition there was marked swelling and congestion of the spleen.

The eary stages of focal necrosis in the spleen and liver are

Fig. 1. Early stages of focal necrosis in the spleen and liver.

not unlike in appearance the early development of miliary tubercle (fig. 1). As the lesions grow older, much of this early resemblance is lost. While the older lesions continue to bear a superficial resemblance to nodular tubercle (fig. 2), they can usually be distinguished by their gross appearance on section. Surrounded by a relatively thin fibrous capsule, the content appears as a thin, semi-translucent homogeneous mass, lacking the dry caseous appearance of material usually found in a tubercle of this size. Differential staining of smears will, of course, serve to distinguish them.

In the more acute cases, when death occurred prior to the development of focal changes, a greatly tumefied spleen was the

only gross pathological change observed. There were all graduations between the extremes and in three still-born and several newly-born guinea pigs the specific microörganism was recovered from the spleen and heart-blood when no macroscopic change could be detected. The microörganism has been isolated from the uterus in endometritis and from small nodular lesions situated at the chondro-costal articulations. In a few cases there was some involvement of Peyer's patches, which appeared swollen with greyish elevated points. Lymphoid tissue in other localities rarely showed evidence of involvement.

Whenever typical lesions were present, we never failed to

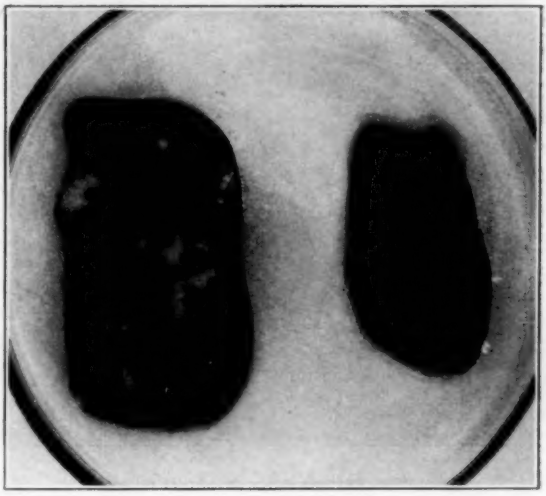

FIG. 2. Older lesions, bearing a superficial resemblance to tuberculosis.

recover the specific microörganism. Routine cultures were made from the spleen and heart-blood of a large number of guinea pigs dying from various causes, as well as from the heart-blood of guinea pigs bled for complement. The vast majority of these cultures proved sterile; others were contaminated with various microörganisms, depending to a great extent on the temperature and the elapsed time between death and necropsy.

In six cases observed in rabbits, gross lesions were found in the lungs only. These small nodular tubercle-like lesions consisted of a relatively thick fibrous wall containing thin semi-caseous material (fig. 3.)

ETIOLOGY

Smears made from lesions were uniformly negative for acid-fast microörganisms, but relatively small, Gram-negative bacilli were aways present. Pure cultures of this microörganism were readily obtained from the lesions in chronic and subacute cases, and from the spleen, liver, heart-blood and bone-marrow of acute cases whether naturally or artificially infected. Pure cultures were also obtained from the lung lesions of rabbits dying from naturally acquired infection.

FIG. 3. Lesions in the lungs of a rabbit.

APPEARANCE AND CULTURAL CHARACTERISTICS

The microörganism grows readily on all ordinary media with the exception of potato. In culture it appears as a relatively small bacillus with rounded ends. It may grow singly, in pairs, and, occasionally, in short chains, is actively motile, aerobic, grows well at 37° C. but not at room temperature. Appearance on agar slants: greyish white, opalescent, smooth, moist colonies, borders regular to undulate. Gelatin is not liquefied, broth becomes uniformly turbid with a thin pellicle and greyish white sediment. It has no characteristic odor, forms acid and gas in dextrose, maltose, galactose and mannitol, faint trace in dextrin and xylose, no acid or gas in lactose, glycerin or salicin.

Natural Infection

There is no history of the disease ever having been present in our stock guinea pigs as an epizootic. In its present enzootic form the mode of transmission has not yet been determined nor has it been possible to diagnose or differentiate the disease during the life of the animal. A number of unthrifty breeding females were selected from stock, isolated and bled from the heart. Their serum was titred for agglutinins against the microörganism recovered from naturally infected cases, after several transfers on plain agar. No reactions were obtained. The animals were sacrificed and no lesions suggestive of pseudotuberculosis were found.

Pathogenicity

All attempts to reproduce the disease in guinea pigs by feeding cultures by means of a pipette or by contaminating their feed over a period of several days failed. In this connection the case of guinea pig R33 (table II) is of particular interest. This animal was first used as a control to guinea pig P. 1 (table I) inoculated subcutaneously with culture, May 16, 1929. Guinea pig P. 1 died 5 days after inoculation. Guinea pig R. 33 was kept under observation until June 27, bled from the heart, and the serum titred for agglutinins against the microörganism reisolated from the spleen of guinea pig P. 1. No reaction was obtained. R. 33 was then given daily doses of culture on sprouted oats for a period of one week, kept in isolation and bled from the heart on July 25, Aug. 27, Sept. 9 and Nov. 7, the serum being entirely devoid of agglutinins for the microörganism fed. On November 14, R. 33 was inoculated subcutaneously with 0.5 cc of culture suspended in normal saline having a turbidity approximating 0.5 of McFarland's nephelometer 1. Guinea pig R. 33 became acutely ill and was bled from the heart, Nov. 23, nine days after inoculation. The serum obtained from this bleeding titred for agglutinins against the homologous antigen, and against type strain *S. enteritidis* 190 E gave complete agglutination in a dilution of 1:160. This animal died Nov. 24, 10 days after inoculation, and at autopsy a large area of caseous necrosis of the subcutaneous tissues was found at the point of injection. The peritoneum appeared highly reddened and contained a small quantity of fluid, the spleen was swollen to about twice normal size and studded with pin-head-size nodular lesions identical with those found in naturally infected cases. (fig. 3).

TABLE I—*Summary of transmission experiments*

ANIMAL	INOCULUM	ROUTE	DIED OR KILLED (DAYS)	REINOCULATED (DAYS AFTER)	INOCULUM	ROUTE	DIED OR KILLED (DAYS)	MICRO-ORGANISMS RECOVERED	AUTOPSY FINDINGS
G.P. P1	Culture	Subcut.	5					+	Large local lesion; pin-point lesions, liver and spleen
G.P. 180	Spleen G.P. 1	Subcut.	13					+	Local lesion; pin-point foci, liver and spleen
G.P. 181	Spleen G.P. 1	Subcut.	14					+	Local lesion; pin-point foci, liver and spleen
G.P. R33	Culture	Fed		140	Culture	Subcut.	D. 10	+	Local lesion; pin-head foci, spleen
G.P. 207	Culture	Subcut.					K. 233	—	No visible lesions
G.P. 208	Control	Contact					K. 233	—	No visible lesions
G.P. 209	Culture	Subcut.	8					+	Local lesion; liver and spleen swollen
G.P. 218	Culture	Subcut.	2					+	Local lesion; septicemia
G.P. 219	Culture	Subcut.	2					+	Local lesion; septicemia
G.P. 220	Control	Contact					K. 223	—	No visible lesions
G.P. 231	Culture	Subcut.	4					+	Local lesion; spleen twice normal size
G.P. 232	Culture	Intrap.	18 hrs.					+	Septicemia
G.P. 233	Culture	Conjunct.	4					+	Septicemia
G.P. 234	Culture	Conjunct.		68	Culture	Eye, nose	K. 196	—	No visible lesions
G.P. 235	Culture	Oral		68	Culture	Subcut.	K. 196	—	No visible lesions
G.P. 236	Culture	Oral		68	Culture	Subcut.	K. 196	—	No visible lesions
G.P. 237	Culture	Subcut.	12					+	Large local lesion; spleen greatly swollen, pin-point lesions
G.P. 238	Culture	Subcut.	3					+	Local hemorrhagic infiltration, septicemia

G.P. 239	Killed culture	Subcut.		67	Culture	Subcut.	K. 208	—	No visible lesions
G.P. 240	Killed culture	Subcut.	25†					—	Semi-caseous local lesion only
G.P. 241	Killed culture	Subcut.	50†					—	No visible lesions
G.P. 242	Killed culture	Subcut.		67	Killed culture	Subcut.	K. 230	—	No visible lesions. Titre, 1:640
G.P. 245	Culture	Intrap.	17					+	Large local lesion; chronic peritonitis
G.P. 246	Culture	Skin*					K. 208	—	No visible lesions
G.P. 247	Culture	Intracut.		67	Culture	Subcut.	K. 208	—	No visible lesions
Rab. 205	Culture C17	Subcut.		94	Culture C17	Subcut.	K. 267	—	No visible lesions
Rab. 206	Culture C17	Subcut.	66					+	Large caseous local lesion only
Rab. 173	Control	Contact					K. 255	—	No visible lesions
Rab. 229	Culture	Intraven.	1¼					+	Septicemia
Rab. 230	Culture	Intrap.	18 hrs.					+	Septicemia
Rab. 243	Culture 219	Intrap.					K. 230	—	No visible lesions
Rab. 244	Culture	Subcut.	28					‡	Decomposed
Chick. 25§	Culture	Intraven.	6					+	Liver and spleen about twice normal size
Chick. 25¢	Culture	Intrap.	§						Titre, 1:80
Rat. 6	Culture	Fed					K. 90	—	No visible lesions
Rat. 4	Control						K. 90	—	No visible lesions

*Scarified.
†Intercurrent disease.
§Ill but recovered.
‡No autopsy held.

Pure cultures of the specific microörganisms were reisolated from the heart-blood, spleen and bone-marrow.

Subcutaneous and intraperitoneal injection of culture or with an emulsion of spleen pulp from guinea pigs dead from naturally acquired or experimentally induced disease was, with one exception, fatal in from 18 hours to 14 days. The specific microörganism was invariably recovered from the heart-blood, liver, spleen and bone-marrow.

Anatomical Changes

Following subcutaneous inoculation there was invariably a large area of caseous necrosis of the underlying tissues surrounding the site of injection. In animals dying within a few days, the picture was that of an acute septicemia with swelling and engorgement of the spleen. In animals surviving for a longer period small areas of focal necrosis were found in the liver and spleen; these varied in size up to and approximating the lesions found in cases of natural infection. Intraperitoneal inoculation was followed by peritonitis, swelling of the spleen and the general appearance of septicemic infection. A drop of culture placed in the conjunctival sac of two 350-gram guinea pigs caused the death of one in four days. This animal became acutely ill within 40 hours; a profuse diarrhea developed with weakness and prostration. Blood removed from the heart a few hours prior to death contained the specific microörganism in pure culture. The anatomical picture was that of an acute septicemia and the microörganism was recovered from the heart-blood, liver, spleen, peritoneal fluid and bone-marrow. The other guinea pig was acutely ill but recovered and thereafter until killed, 196 days later, had an agglutination titre of from 1:40 to 1:80. Intracutaneous inoculation of a minute quantity of culture as well as rubbing into the scarified skin produced illness but not death and rendered the animals relatively immune. Inoculation with killed cultures promoted the formation of agglutinins and complement-fixing substances and rendered the recipients immune to twice the usual lethal dose of culture administered subcutaneously.

Pathogenicity for Rabbits

Two young rabbits succumbed in from 18 to 30 hours, respectively, following intraperitoneal and intravenous inoculation of culture. Three aged rabbits (205, 206 and 254) responded to subcutaneous injection, with formation of a large caseous mass at the point of inoculation, which persisted for about 90 days and

then gradually disappeared. The local lesion appearing on rabbit 205 was aspirated 15 days after inoculation and the microörganism recovered. Twenty-nine days after inoculation, the serum of rabbit 205 had an agglutination titre of 1:20,000. The serum of rabbit 206 had a titre of 1:640 in the same period; this rabbit died 37 days later, with a septicemic type of infection. Rabbit 243 recovered from intraperitoneal inoculation of 0.25 cc of culture and 70 days after inoculation had an agglutination titre of approximately 1:20,000. Rabbits 205 and 243 were destroyed 267 and 230 days after inoculation. No lesions were found and cultures remained sterile.

Pathogenicity for Chickens

A cockerel developed diarrhea, became prostrated in 48 hours and died in 6 days, following the intravenous inoculation with culture. The microörganism was recovered from the blood before death and from the heart-blood, liver, spleen and bone-marrow after death. A second cockerel, inoculated intraperitoneally, was acutely ill but eventually recovered.

Aged white rats proved resistant to infection by feeding.

A brief summary of inoculation and feeding experiments is given in table I.

Serological Reactions

Rabbits were inoculated subcutaneously with a culture isolated from the lungs of rabbits dying in pen C. 17. Other rabbits were inoculated in a similar manner with a culture isolated from the spleen of guinea pig 219. As shown in table II, the serum of rabbit 205, inoculated with a culture isolated from the lung of rabbit C. 17, gave perfect cross-agglutination, using as antigen culture 219 isolated from a guinea pig, while the serum of rabbit 243, inoculated with a culture from the guinea pig, gave perfect cross-agglutination with culture C. 17, isolated from the rabbit as antigen, thereby practically establishing the unity of these two strains.

The serum of rabbits 205 and 243 agglutinated type strain *S. enteritidis* 190 E in a dilution of 1:5000; while a standardized type antiserum against *S. enteritidis* 190 E agglutinated both strains C. 17 and 219 in dilutions of approximately 1:10,000 and its homologous antigen in upwards of 1:80,000. The serum of guinea pigs inoculated with living or dead culture of strain 219, agglutinated type strain *S. enteritidis* 190 E in practically the same dilutions as the homologous antigen. It would therefore

TABLE II—*Agglutination tests*

SERUM	ANTIGEN	1:20	1:40	1:80	1:160	1:320	1:640	1280	2560	5120	10240	20480	40960	81920
Rabbit 205 (Inoculated with culture C17 isolated from lung of rabbit C17)	C17	++++	++++	++++	++++	++++	++++	++++	++++	+++	+	−	−	
	219	++++	++++	++++	++++	++++	++++	++++	++++	++	+	−	−	
	190E	++++	++++	++++	++++	++++	++++	++++	+++	+++	++	−	+	
	190A	++++	+++	±	−	−	−	−	−	−	−	−	−	
	Oshawa 3	++++	++++	+++	+	−	−	−	−	−	−	−	−	
	Diffluens	+	+	±	−	−	−	−	−	−	−	−	−	
	Pullorum	+++	++	++	++	+	+	−	−	−	−	−	−	
	Sanguinarium	++++	+++	+	−	−	−	−	−	−	−	−	−	
Rabbit 243 (Inoculated with culture 219 isolated from spleen G.P. 219)	C17	++++	++++	++++	++++	++++	++++	++++	+++	+++	++	−	−	
	219	++++	++++	++++	++++	++++	++++	++++	+++	+++	++	−	−	
	190E	++++	++++	++++	++++	++++	++++	++++	+++	+++	− −	−	−	
	190A	++++	+++	+	−	−	−	−	−	−	−	−	−	
	Oshawa 3	++++	+++	++	+	−	−	−	−	−	−	−	−	
	Diffluens	−	−	−	−	−	−	−	−	−	−	−	−	
	Pullorum	++++	−	−	−	−	−	−	−	−	−	−	−	
	Sanguinarium	−	−	−	−	−	−	−	−	−	−	−	−	
Standardized Antisera: Enteritidis 190E	C17	++++	++++	++++	++++	++++	++++	++++	++++	++++	+++	++	+	−
	219	++++	++++	++++	++++	++++	++++	++++	++++	+++	++	+	+	−
	190E	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	+++
	190A	−	−	−	−	−	−	−	−	−	−	−	−	−
Enteritidis 190A	C17	−	−	−	−	−	−	−	−	−	−	−	−	−
	219	−	−	−	−	−	−	−	−	−	−	−	−	
Typhoid 101 (Rawlings)	219	++	++	+	−	−	−	−	−	−	−	−	−	
Paratyphoid A (Kessel)	219	−	−	−	−	−	−	−	−	−	−	−	−	
Paratyphoid B (Rowlands)	219	−	−	−	−	−	−	−	−	−	−	−	−	
Dysentery (Shiga)	219	−	−	−	−	−	−	−	−	−	−	−	−	
Dysentery (Flexner)	219	−	−	−	−	−	−	−	−	−	−	−	−	
Typhoid (Bender)	219	++++	++++	+++	+	−	−	−	−	−	−	−	−	

TABLE IIa—*Agglutination tests*

SERUM	ANTIGEN	1:20	1:40	1:80	1:160	1:320	1:640
Pullorum (Positive serum from hen 471)	219	++++	++++	+++	+	–	–
	190E	++++	+++	+++	++	–	–
	190A	+++	+++	+++	+	–	–
	Oshawa	++++	++++	++++	+++	++	–
	Diffluens	+++	+++	+++	+	–	–
	Pullorum	++++	++++	++++	++++	+++	–
Pullorum (Negative serum from hen 281)	219	–	–	–	–	–	–
	190E	–	–	–	–	–	–
	190A	+	–	–	–	–	–
	Oshawa	+++	–	–	–	– –	–
	Diffluens	–	–	–	–	–	–
	Pullorum	–	–	–	–	–	–
Rabbit 173 (Normal)	C17	++	–	–	–	–	–
Rabbit 335 (Control)	219	+++	–	–	–	–	–
	190E	++	–	–	–	–	–
	190A	++	–	–	–	–	–
	Oshawa	+++	–	–	–	–	–
	Diffluens	+++	++	+	–	–	–
	Pullorum	–	–	–	–	–	–
	Sanguinarium	–	–	–	–	–	–

appear that strains C 17 and 219 and *S. enteritidis* 190 E are closely related if not identical.

It is interesting to note than *S. pullorum*-positive chicken serum gave a positive group reaction with all antigens used, while pullorum-negative chicken serum gave practically no reactions except in a dilution of 1:20.

Complement-fixation tests on the serum of inoculated guinea pigs gave results practically parallel to the agglutination tests. Strain 219 was used as an antigen.

Origin of bacterial strains and antisera used: Strain C 17 was isolated from the lungs of rabbit C 17. Strain 219 was isolated from the spleen of guinea pig 219. Enteritidis strains 190 E and 190 A were isolated from cases of food poisoning in man, by the New York State Health Laboratories, Albany, N. Y. Oshawa 3 is Morgan's bacillus and was isolated from a case of food poisoning occurring at Oshawa, Ontario, by Dr. McNabb, of the Ontario Health Department Laboratories, Toronto. Paradiffluens also was isolated by Dr. McNabb, from a case of cheese poisoning at Bowmanville, Ontario. *S. pullorum* 4011 and *E. sanguinarium* are stock strains isolated and carried by these laboratories.

TABLE IIb—*Agglutination tests*

ANIMAL	HISTORY	ANTIGEN	1:20	1:40	1:80	1:160	1:320	1:640
G.P. R33	June 27, 1929. Bled	219	–	–	–	–	–	–
	June 27-July 3. Fed culture 219 on feed							
	July 25, 1929. Bled	219	–	–	–	–	–	–
	Aug. 27, 1929. Bled	219	–	–	–	–	–	–
	Sept. 9, 1929. Bled	219	–	–	–	–	–	–
	Nov. 7, 1929. Bled	219	–	–	–	–	–	–
	Nov. 14, 1929. Inoculated subcutaneously with 0.5 cc of culture, density 0.5 McFarland nephelometer 1							
	Nov. 23, 1929. Bled	219	++++	++++	++++	+++	–	–
	Nov. 24, 1929. Died							
G.P. 235	Sept. 17, 1929. Fed 1 cc of culture	219	–	–	–	–	–	–
	Nov. 7, 1929. Bled	219	+++	+++	++	+	–	–
	Nov. 14, 1929. Inoculated subcutaneously with 0.5 cc of culture 219							
	March 17, 1930. Bled	219	++++	++++	++++	++++	+++	+++
		190E	++++	++++	++++	+++	+++	–
G.P. 236	Sept. 17, 1929. Fed 2 cc of culture	219	–	–	–	–	–	–
	Nov. 7, 1929. Bled		+	+	+	–	–	–
	Nov. 14, 1929. Inoculated subcutaneously with 1 cc of culture 219							
	March 18, 1930. Bled	219	++++	++++	++++	+	–	–
		190E	++++	++++	+++	–	–	–

G.P. 242	Sept. 18, 1929. Inoculated subcutaneously with 2 cc of killed culture	219	−	−	−	−	−	−
	Nov. 7, 1929. Bled	219	++++	++++	++++	+	−	−
	Nov. 14, 1929. Inoculated subcutaneously with 2 cc of killed culture							
	March 17, 1930. Bled	219	++++	++++	++++	++++	++++	++++
		190E	++++	++++	++++	++++	++++	++++
G.P. 239	Sept. 18, 1929. Inoculated subcutaneously with 1 cc killed culture	219	−	−	−	−	−	−
	Nov. 7, 1929. Bled		++++	++++	++++	+	−	−
	Nov. 14, 1929. Inoculated subcutaneously with 1 cc of culture 219							
	March 17, 1930. Bled	219	++++	++++	++++	+++	+++	+++
		190E	++++	+++	+++	++	++	+
G.P. 208	Control	219	−	−	−	−	−	−
G.P. 246	Control	190E	−	−	−	−	−	−

Antisera titred against stock laboratory strains of the typhoid-paratyphoid-enteritidis group were obtained through the courtesy of Drs. McNabb and Letts, of the Ontario Health Department Laboratories.

Enteritidis serum 190 E has no group agglutination titre against *S. enteritidis* 190 A and has a specific agglutination titre of 1:160,000.

Enteritidis serum 190 A has no titre against *S. enteritidis* 190 E or paratyphoid A or B and a specific titre of 1:320.

Organism	*Maximun group agglutination*	*Maximum specific agglutination*
Typhoid (Rawlings)	1:80	1:20,000
Typhoid (Bender)	1:80	1:30,000
Paratyphoid A (Kessel)	1:80	1:80,000
Paratyphoid B (Rowlands)	1:40	1:40,000
Dysentery (Shiga)	1:80 (to Flexner)	1:5,000
Dysentery (Flexner)	1:640 (to Shiga)	1:40,000

Pullorum-positive serum has a specific agglutination titre of 1:320.

Discussion

Much work has been done on the so-called spontaneous disease of guinea pigs and there are many references in literature to pseudotuberculosis in this animal. A great many different microörganisms have been incriminated, the majority belonging to the paratyphoid-enteritidis group.

Pathologically our cases differed from the usual descriptions of pseudotuberculosis of rodents in that there was little if any involvement of lymph-glands. The gross anatomical changes in the young animal (fig. 1) were very similar to those described by Feldman,[1] as found in multiple focal splenitis of guinea pigs, from which he isolated a streptococcus.

Serologically the strains of Salmonella isolated from cases of pseudotuberculosis in guinea pigs and rabbits appear to be closely related to or identical with *S. enteritidis* strain 190 E isolated from a case of food poisoning in man by the New York State Laboratory, Albany, N. Y.

Summary

An enzootic form of so-called "pseudotuberculosis" in stock guinea pigs and rabbits caused by a member of the *Salmonella enteritidis* group is described. Attempts were made to reproduce the disease by feeding and inoculation of pure cultures of a microörganism isolated from about 100 cases of natural infection in guinea pigs and rabbits and the results tabulated and discussed.

Serological tests were made using several type strains and standardized antisera.

Several strains of the genera Salmonella and Eberthella appear capable of inciting the formation of pseudotubercle in rodents. The resemblance to true tuberculous lesions in these animals is more apparent than real and they can as a rule be readily differentiated macroscopically.

It is interesting to note that out of a total of 856 necropsies made during the year, not a single case of natural or spontaneous tuberculosis has been found in stock guinea pigs or rabbits, nor have any of these inoculated animals at any time reacted to a tuberculin test.

ACKNOWLEDGMENTS

We are indebted to Dr. A. L. McNabb, Director of Laboratories, Ontario Department of Health, Toronto, and to Dr. F. L. Letts, of the Ontario Department of Health, Ottawa, for cultures of type strains of *S. enteritidis* 190 E and 190 A, Oshawa 3 (Morgan's bacillus), paradiffluens, typhoid and paratyphoid strains and antisera.

REFERENCE

[1]Feldman, W. H.: Amer. Jour. Path., v (1929), 4, pp. 371-365.

Court Backs Drug Officials

"The fine of $500 recently imposed by Judge James A. Lowell, of the federal court at Boston, Mass., upon a wholesale drug concern of Worcester, Mass., for misbranding tincture of digitalis and other drug products, is evidence of continued regulatory activity by the federal government to insure the safety of the nation's drug supply," according to W. G. Campbell, Director of Regulatory Work, U. S. Department of Agriculture.

The fine was imposed upon Brewer and Company, Inc., wholesale druggists. The company, through its president and treasurer, Howard D. Brewer, pleaded guilty to an information charging them with misbranding and adulterating drugs. The drugs misbranded were digitalis, nux vomica, and other products. The government charged that the nux vomica was almost twice as strong and the digitalis one-half as strong as the labels indicated.

"These products were examined in connection with a general survey of medicinal products on the American market." stated Mr. Campbell. "They are substances for which available analytical methods have been thoroughly tested and proved dependable."

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CONTROL OF ANTHRAX IN LIVE STOCK OF THE NORTHWEST*

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State Live Stock Sanitary Board

Much may be said about the control of anthrax in live stock, but this paper will endeavor to touch only on enough history and technical matter to refresh the memory and substantiate methods used. All veterinarians are familiar with the age-old records of its necropsy, so that part of this narration will be omitted.

This disease is recognized as one of the most destructive animal scourges and is one of the oldest. Even Moses mentions it in Exodus 9:9. Homer, Ovid, Plutarch, Virgil and many others include it in their writings. Few animals are entirely immune. Man, also, may become infected. As early as 1617, near Naples, 60,000 people were reported to have died from anthrax. In 1770, fifteen thousand persons were said to have perished in as short a time as six weeks in San Domingo from eating carcasses of animals dead from anthrax, although the stomach acids are generally conceded to kill the bacilli. Spores, which form rapidly when exposed to air, must have been present, as they are resistant to these acids. Microscopical discovery of the etiological factor by Pollander, in the 19th century, was not accepted by scientists until Devaine, in 1863, named it *Bacillus anthracis.* Robert Koch, in 1876, cultured it, discovered spore formation, succeeded in transmitting the disease to animals by feeding hay mixed with thistles to irritate the intestinal tract and spraying this with the new culture.

Several outbreaks have occurred in Oregon. On the coast, luckily, it has invariably appeared during the cool, rainy months. One outbreak, in 1928 and 1929, was thought to be carried in by means of dairy feed imported from a foreign source. The herds involved were scattered, and were eating feed supplied by the same commercial company at the time. It was in a dairy section and no symptoms were noted by the herd-owners. The afflicted animals were merely found dead and a diagnosis was made from autopsy of the various carcasses checked by microscopical and

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guinea pig inoculation methods at the Veterinary Department of the Oregon Agricultural Experiment Station.

Between 5,000 and 6,000 head of dairy cattle, within an imaginary boundary considered as an infected area, were vaccinated with anthrax aggressin by the two local veterinarians and the writer. The barns where bovine deaths took place were thoroughly cleaned and disinfected with strong chlorid of lime solution (30 per cent available chlorin, 1 pound to 3 gallons of water). Where it was impractical to burn the cadaver, a deep hole was dug just outside the barn-door and the carcass rolled into it, covered with quick lime, then the dirt. There has been no return of the disease in this locality. None of the herds have been re-vaccinated. Across the border from Oregon, a man who lost quite heavily during this particular outbreak purchased two new cows last August and, against the advice of his veterinarian, placed them in his herd without immunization. Both animals died of anthrax. The rest of the herd had been vaccinated with aggressin about six months before, at the time of the trouble.

First Outbreak in Oregon

Anthrax appeared, probably for the first time in Oregon, in an irrigated valley during the summer of 1928. It was where beef cattle grazing was the chief industry. There has been an opportunity here to note symptoms in several species of animals, cattle, horses, sheep and swine. It was seen, also, in man. Some of the cow-boys on one ranch developed charbon skin lesions. Anthrax organisms were isolated from them. One man had an extensive edema of the arm secondary to the local infection. These men were treated with anti-anthrax serum, in addition to local antiseptics. There were no fatalities among the men. Two horses used in snaking hides from the fields before a quarantine was established died of anthrax.

During the course of this outbreak, only a few peracute cases were noted clinically. The most of the animals were not seen until after they had died. The few clinical cases noted seemed to be in great pain. The eyes would roll and jerk in a convulsive manner. The mucous membranes were dark red, *i. e.*, very congested. Inhalation seemed to be restricted much as if a band had been drawn tightly around the thorax. Groans periodically accompanied inspiration and the animals seemed to be paralyzed through the region of the loins. The hind quarters extended straight out posteriorly from the body and the pelvic

muscles were rigid. These were always down when found and carried a temperature ranging from 104 to 107 degrees F. In these cases, large doses of anti-anthrax serum served only to prolong life.

Other acute cases were noted in which the disease appeared suddenly. The animals would sway to and fro and almost fall at times. Foamy, sometimes blood-stained, discharges ran from the nose and mouth. They would finally lie down and appear to be so sick the muzzle would rest on the ground to support the head. These animals would die in a half or three-quarters of an hour without a struggle. Apparently, they would simply quit breathing and the heart cease beating. Fully seventy-five per cent of these animals would recover when treated with one to two hundred cubic centimeters of anti-anthrax serum while they were on their feet.

Probably seventy-five per cent of the sick animals died before they were discovered by their care-takers, even though they were constantly riding the various pastures and carrying serum for emergency treatment. Pure blood which passed from the rectum usually was strewn about the place where the dead animals lay. This blood was always taken up and placed on the burning carcass by the coroner's crew. No cases were seen during this outbreak, where external swellings appeared, except in horses.

Control Measures Inaugurated

After a positive diagnosis of anthrax had been established, a meeting was called for the live stock men then in the community. Danger of its spreading to other herds, the probability of permanently infected fields and advice concerning prevention and suggestions for quarantine measures were given. These men were then asked just what course of procedure they wished to follow. They became very much excited and expressed a desire to back any obligation the authorities advised. They, therefore, virtually enforced the quarantine measures themselves while the official veterinarians directed them.

The first infected herd had already been placed under rigid quarantine. A quarantine rider was appointed to see that the stringent measures were strictly complied with. The foreman was required to have cow-boys ride constantly during the day to watch for sick and dead animals. When a carcass was found, it was sprayed heavily with oil to keep the flies off until the coroner's

crew could haul wood enough to burn it thoroughly. Nothing was allowed to be left to mark the site of the death scene except a little pile of fine dry ashes. This crew worked diligently for a little better than a month before catching up with the death-rate.

Special anthrax spore vaccine No. 4 in combination with anti-anthrax serum was used on the infected herd, as it was more desirable to suffer additional loss than to re-work the cattle. The disease spread to only four adjoining ranches during the first season and in each case deaths started while preparations for administering protective measures were being made. It was thought that flies were the principal factors responsible for the spread. There was a loss of only three animals attributed to the disease on two of these adjoining pastures, one bull and one horse on another, and about twenty-five head of pure-bred beef cattle on the other. The latter pasture was separated from the infected fields by an irrigation canal and a narrow river, but was on the windward side so that flies from sick and dying animals could be blown across. The cattle were well bred and thin skinned and, therefore, more easily infected by fly bites than were grade animals. Drainage may have played a very small part.

Exposed Herds Vaccinated

Anthrax aggressin was used on all cattle, that could be classed as being within the dangerous area, as rapidly as possible. Two of the herds where the three animal losses occurred were vaccinated with large doses of anti-anthrax immune serum at once. This was followed, in from ten to twenty days, with the aggressin treatment. Dairy products from one dairy herd were prohibited from the open market for a period of three weeks because of the death of two horses with anthrax. No further losses occurred in this dairy.

Where the loss of twenty-five head occurred, the owner neglected to take protective measures until three head of cattle had died. He then used aggressin to save expense, but twenty-one days later begged to have serum used on his herd. This was done. Only two more deaths followed this last course of treatment. These were within a period of two or three days after the anti-anthrax serum was used.

It might be mentioned that while the death-rate slackened somewhat after the use of anti-anthrax serum and spore vaccine in the first infected cattle herd, losses continued among them for a period of more than a month after treatment. It may be

noted that a small loss took place even after the other various agents for protection had been used, which is but another reminder of the variability in animals in developing immunity against anthrax.

For the most part, the quarantine was well observed by the various cattlemen. One of the cow-boys, however, employed on a quarantined ranch, slipped out one Sunday with a saddle horse and two pack animals, going up on the Indian reservation. The entire Indian police force went after him. He was placed under arrest by them and brought to the reservation line to be escorted, by our quarantine rider and some willing helpers, ceremoniously back to the premises whence he came. There he remained for the rest of the season.

Big Bill Causes Trouble

After official quarantine had been established, county health officers prohibited the men suffering with anthrax from frequenting public places. Big Bill, one of the cow-boys who developed charbon, became intoxicated and made a trip to the city. He visited one doctor's office after another, frightening their office girls as well as causing much concern among the medical profession there by unwinding his anthrax dressings and throwing them about the room as he loudly demanded medical aid. There was a call from each office he visited to the local police department for his arrest. The police officers agreed to arrest him, provided the physicians would arrange for a pest-house in which to lock him up. Not having such a place and refusing to put him in their jail because he was afflicted with anthrax, each time he was turned loose. He was finally brought back to the quarantined ranch without having his wounds dressed, in order to quiet the local public unrest.

Newspaper articles about the anthrax trouble came out in the local papers. This promoted some uneasiness among some of the local business folk. Some of the stores placed vessels containing antiseptic solutions on their counters, in which they required persons making purchases, to drop their money if they came from the infected area. Little did they realize that ordinary antiseptics were not capable of killing the spores of anthrax. They did not know that it requires forty minutes for a 1-2000 solution of mercuric chlorid to kill anthrax bacilli, nor that boiling in water for four hours was necessary to kill virulent anthrax spores with which they might come in contact, if a purchaser should be carry-

ing infection. Yet, common serum or rabbit serum is known to destroy the bacilli before spore formation takes place.

In spite of veterinary police measures, anthrax has slowly spread to new fields in this valley. Two aggressin breaks occurred in 1929, about two months from the date of the original vaccination. Sero-vaccination was used in an effort to control this undesirable circumstance. Animals continued to die from the disease for eighteen to twenty-one days after treatment. The anthrax season is usually rather short in this valley, which is of some material assistance in its control.

Substantiating the spread of anthrax by flies, Rogers claims in 1901 to have transmitted it through the horse-fly, house-fly and gad-fly, which fed on animals that were dying with the disease and then in ten and twenty minutes later, respectively, were allowed to bite healthy susceptible animals. Flies used on virulent, artificial cultures and permitted to bite healthy guinea pigs, after three hours to nine days, uniformly produced the disease. In addition to flies in this valley, other possible carriers were buzzards, magpies, crows, dogs, coyotes and irrigation.

Double Treatment Gains Favor

The double treatment has gained favor among the stockmen until now they have used it in many of the uninfected fields. An occasional loss has followed its use, in which anthrax bacilli have been isolated microscopically. This means that these pastures may, possibly, be classed as infected.

This year, care of most of the biological products used for immunization was supervised by the veterinarians who did the vaccinating. In 1928 and 1929 little attention was paid to that phase of the work. The men in charge of the various herds of cattle ordered and cared for them until they were used.

Although the vaccinating was done much later in the season the two former years, much more satisfactory results seem apparent this season. Fewer animals came in this summer, although about 12,000 cattle, 245 horses, 4,730 sheep and 20 hogs were immunized with the assistance of two local veterinarians.

Susceptibility and clinical symptoms in the horse seem to be about the same as in cattle, only they are more prone to skin infection. Large, well circumscribed swellings arise under the throat, on the neck and often on various parts of the trunk. A

high temperature develops and, if no treatment is given, may end in death.

Symptoms in sheep are similar to those in cattle. They are noticed standing by themselves, perhaps, in the evening. Rumination is suspended. There is uneasiness. The next morning the animal is found either dead or in convulsions (foaming at the mouth, throwing the head backward, rolling the eyes). Convulsions are soon followed by death.

Swine show swelling of the throat, high temperature and intestinal involvement. Dogs and cats will contract the disease similarly to hogs, but are classed as less susceptible. The symptoms are: swelling of the throat (therefore, difficult swallowing), vomiting, profuse bloody diarrhea, high fever and death.

Birds, apparently, are immune under natural conditions. Chickens are less susceptible than swine, but when chilled may take the disease after feeding on the discharges from, or on, dead carcasses. They run a rapid and fatal course. Death follows in twenty-four hours. Bacilli are found in the blood. During the course of the disease, swelling develops in the comb and wattles, around the eyes and on the tongue, palate and feet. Extreme weakness, violent tremors, convulsions and bloody diarrhea are said to characterize the disease. Frogs are immune but will develop the disease after immersion in warm water, according to Dawson, of Delaware. Young pigeons of certain breeds, sparrows, finches, canaries, yellow-hammers and red breasts have been successfully inoculated. In man it is usually localized but may be generalized where bacilli are inhaled or spores are taken through the mouth.

Curative Treatment with Serum

Treatment acknowledged to be superior to any other in man is said by Eichhorn to be 30 to 40 cc of anti-anthrax serum injected in three or four different places. If there is no improvement in twenty-four hours, an additional 20 to 30 cc should be injected.

Control measures in live stock, of course, consist of vaccination, sanitary measures and prompt disposal of animals dead of the disease. Burning is the most effectual way of disposing of carcasses.

Pasteur opened the way to immunization and upon his discovery is based our present methods of serum therapy for disease protection.

Economists have called this the day of machinery, because of mechanical aid in our daily lives. Appliances for, and methods of, vaccination, like airplanes and automobiles for transportation, are such as to speed the work. Veterinarians now have syringes and other instruments for convenience at their command which enable them to work more rapidly than in former times. The use of automatic-filling syringes, convenient chutes and squeezes made it possible for vaccination work to be accomplished more quickly this season.

Eichhorn, in Department of Agriculture Bulletin 340, published in 1915, said that anthrax serum alone would effect a cure, even after the bacilli had reached the blood-stream, while Ricketts and Dick, in their book published in 1913, stated that it has no value after the bacilli invade the blood-stream.

Experience during the past few years might indicate that both statements could be true, depending upon the number of bacilli in the blood-stream at the time the serum is injected. An initial dose of 200 to 250 cc of anti-anthrax serum was used to treat sick animals during the latter part of this season with much better results than the 100-cc dose.

Red water, or icterohemoglobinuria, is also prevalent in this area. It is very difficult to differentiate the symptoms from anthrax. Treatment, however, is simplified by the fact that those cases usually respond to anti-anthrax serum treatment, only not quite so rapidly, and it seems to reequire more treatment. Anthrax cases, however, do not respond to red water serum treatment.

A record of results in the valley, thus far this season, would indicate that where sero-vaccine and aggressin are cared for and used by veterinarians, both give equally effective protection. In fact, no losses had occurred up to August 6 in aggressin-vaccinated herds, while some loss had been sustained in herds treated with the former product.

Method of Vaccinating Changed

The method of vaccinating this spring differed from that used the two previous seasons in that a second dose of spore was given following the double vaccination. It was administered ten days after the first sero-vaccination in some herds and fourteen days in others. This system was decided upon because deaths continued about the same from eighteen to twenty-one days after the sero-vaccine administered in already infected herds.

This probably indicated that the process of immunization was still being built up for that length of time. It was thought, therefore, that a second dose at about the interval of ten or fourteen days would increase the protection. This is in line with the course used in the production of immune serums.

The dose of spore vaccine was often graduated according to the estimated size and weight of the patient, as well as the constitutional appearance of the subject. Thus far the results obtained have been gratifying.

Aggressin was used in 15-cc doses. A few animals were vaccinated with it, which associated at intervals with animals double-treated and in fields where losses had taken place early in the spring, before the vaccinating was begun. To date, none of them have died (August 6, 1930).

Sheep seemed to respond to aggressin much earlier than cattle, even though they were dying with anthrax at the time they were vaccinated. Spore vaccine and serum is not considered safe to use on sheep. In one flock of about 2,200, where the loss from the disease had been about two to ten per day, mortality decreased to only an occasional one almost immediately following the treatment. Total loss in this herd was about forty-five head.

The Pasteur vaccines are considered efficient, but they deteriorate quite soon, while the spore vaccine keeps better and can be graduated more closely. It is said that rarely it may increase in virulence. Therefore, veterinarians and biological houses should use every effort to keep the products they handle under proper temperature to assure its potency and render it possible to obtain the maximum results.

Biological Products Should Be Handled with Care

Serum companies should be equally as careful as other persons who handle their wares, in selecting corks for the containers before they are placed on the market. Some of the stoppers used were dead or rotten and tore easily. This results in spilling the contents and is not only a waste, but is dangerous in case the vaccine escapes from the bottle in very great quantities.

Dieting or gaunting cattle twelve hours seems largely to prevent serum sickness or anaphylactic reactions in previously serum-treated animals. This was practiced on every herd vaccinated this spring and not a single loss resulting from serum administration took place. Only about four animals showed any sickness from the serum whatsoever. Last year, gaunting was

not practiced and quite a number of previously vaccinated animals died within ten to thirty minutes after the needle was withdrawn. This year the cattle were rested after being driven into the valley for about five to ten days before they were permitted to be vaccinated. Many of the cattlemen at first objected to this procedure, but before the season was over they would handle their cattle in no other way.

Bovine serum was used on cattle having had equine serum the previous year. Where it was found necessary to use equine serum on a few of these cattle, one or two small doses were given about a half-hour apart. In case there was no reaction, the balance was administered.

The anti-anthrax serum and special anthrax spore vaccine, from a beef cattle standpoint, is probably the more practical to use at this time in this particular valley, but from a dairy cattle point of view and as a means of anthrax eradication, aggressin or the serum with aggressin is, apparently, the satisfactory thing to use. An additional handling of dairy cattle during the season should not be serious, but owners of beef cattle object to handling their animals late in the season, as might be the case with the use of aggressin, because of their loss in flesh.

The only expense to cattlemen and sheepmen in this valley in Oregon last spring was the cost of their vaccine and the handling of their stock, since the county assisted by paying for the services of the local veterinarians. Even with this saving, the low price on beef and mutton is beginning to make them think that when they ship this fall, it will be necessary for them to go to the cheapest restaurant in town and eat ox-tail soup and tongue to make both ends meet.

Discussion

Dr. N. F. Williams: Mr. Chairman, Dr. Derflinger has presented a very comprehensive paper on anthrax. That paper, when published, will constitute a very valuable addition to the library of any veterinarian. He has touched on all the salient features. He has compared the different immunizing agents and quite thoroughly gone into each phase of the anthrax problem.

Some years ago it was a habit or the custom of biological houses to send their detail men directly to the ranches to put in the hands of the owners vaccines that were dangerous and to show them how to administer the vaccines or to administer the vaccines themselves free of charge and to the exclusion of the veterinarians.

For years and years they regularly sowed anthrax spores in the pastures. As the years went by, the fight to keep the veterinarian out of the anthrax field became more vicious. In fact it was a hopeless situation until the germ-free immunizing agent came on the market. That brought the veterinarian into contact with these cases.

We have found that it is far better to quarantine and burn than it is to depend on spore vaccines for protection. It is our experience that in a herd that is not exposed one may expect a two per cent loss following the use of some of these spore vaccines. This would not be so serious a challenge against spore vaccines had it not been for the elimination of the veterinarian from the operation, because a veterinarian in charge would have recognized the sanitary requirements and would have applied them sufficiently to minimize the spread of the infection.

The anthrax problem is fairly well in hand. Dr. C. A. Cary's experience in Alabama is conclusive that burning or burial and quarantine will control an outbreak. Under the conditions in Alabama it may be easier to enforce positive quarantine measures. In the wide range operations, however, that is more difficult.

Fortunately, in Texas the range men, the cattle-owners themselves, have been convinced that the burning of the carcass is the primary essential of control, that there is a safe measure of protection in the germ-free immunizing agents. They are sold on the fact that with such agents they cannot and are not adding to the infection on their premises.

Location after location in Texas is pointed out today as having been infected because of a faulty diagnosis or a fear of anthrax, followed by the use of a dangerous spore vaccine.

The human equation, that is, the activity of those inferfering or inquisitive persons who want to see what the inside of one of these anthrax carcasses looks like, or those prompted by false thrift to salvage the hide, and become infected, injects itself from time to time.

The field men and the veterinarians of Texas have rendered a meritorious service from the human standpoint in that when they encounter a serious outbreak they inquire about any person in the locality who may be suffering from some unusual skin malady, and in many of those outbreaks they find some fellow being treated by a physician who has not recognized that anthrax is present.

We had a very striking case in a dairy in Texas recently. One cow died on Tuesday and a non-graduate veterinarian was called. He procured some stomach contents and brought it to a laboratory because he suspected food poisoning. The laboratory could not find anything of a suspicious nature in a casual examination. This man was instructed to have his veterinarian bring in several specimens, including the spleen, should any additional losses occur. He returned the next day when two more cattle died and he had the spleen and several buckets of other specimens which he had brought across the country.

That case was diagnosed as anthrax. Animal inoculation was made in the laboratory and the next morning the rabbit died. We called up the owner of this herd and told him to get his graduate veterinarian, who was back from a fishing trip by that time, to take charge of the situation, that the case was positive anthrax; the practitioner recommended 80 cc of serum and 20 cc of aggressin for each animal. That method of vaccination was carried out. There were no further losses in that herd.

The non-graduate veterinarian became infected, as did two of the dairy hands who assisted him in the autopsy. They were taken to different hospitals and the serum treatment was administered. The two men that were sent to the local hospital received, the first day, on Wednesday, as I remember it, 45 cc of serum in graduated doses, starting with a small quantity to avoid anaphylaxis. On Friday they received 100 cc and on Saturday 120 cc. One of those men became restless and although he had lesions on his arm, two of which it was necessary to excise, he did not believe in going on with it any further, so he went to town. It was an exceptionally hot day and he made the trip in the heat of the day and partook of a heavy meal of cucumbers, tomatoes, onions and foods of that character, and refused to return to the hospital.

Sunday morning he wasn't feeling so well and the physician visited him and administered 40 cc of serum. He returned in the afternoon and administered 40 cc more. That man died Monday morning at 3:20 from anthrax. The report was that in rubbing his arm to show his friends how freely he could handle it, the protective wall was broken down and the cutaneous infection became systemic, septicemia resulting.

At another point in a range outbreak a negro and a white man became infected. They received the serum and responded nicely.

In some of those outbreaks the cattle alone were involved, although there were other animals rather closely associated. At other times almost all domesticated animals, and even the deer, are involved. In some areas, especially in Uvalde County, a serious outbreak involved the mules, horses, cattle, sheep, goats, swine, rabbits and the squirrels and deer.

That has been happening heretofore about every five years. In the last few years, aggressin has been used extensively over that area, and serious and widespread or general infection does not occur. It is rather a pleasing demonstration and a reassuring one that the hope of eradicating anthrax and of immediately controlling it is available in the germ-free immunizing agent. It does not appear at this time that the anthrax aggressin has the super-positiveness of the blackleg aggressin. Of course different principles are involved. We are dealing with a more vicious and more persistent organism in anthrax, but I am encouraged to believe that the laboratories that have taken the forward step and have given to us a measure of relief and protection so far above what we had before, will find a means of making their product even more positive than at present.

In our laboratory a positive diagnosis is made upon animal inoculation, and while some of the pictures under the microscope are so conclusive as almost to preclude the possibility of error, picture after picture of that kind fades when checked by the animal inoculation test.

A material percentage of anthrax cases treated with the serum will respond favorably. Anthrax will be controlled, a large percentage of infected animals will be salvaged and the situation will yield just as soon as the live stock interests realize that this is strictly a veterinary problem, requiring keen judgment, constant care, and full observance of strict sanitation.

To those biological laboratories that have brought to this particular problem a measure of protection so safe and sane, the veterinarian owes his sincere gratitude and the live stock interests owe a debt that is not easily discharged.

Again, I say that the essayist has presented one of the most comprehensive, one of the most complete and understandable papers on this subject that it has ever been my pleasure to listen to or to read. I thank you. (Applause)

Dr. C. H. Hays: The question of the fly has been brought in and probably plays an important part. I am not getting on my feet to discuss that point, but recently my attention was called, by a man operating a rendering-plant, to an observation he had made in Minnesota, of the use of a fly repellent composed of kerosene and compound cresol solution. It was one pint of compound cresol solution to one gallon of kerosene.

This plant, in hauling carcasses from the field, was applying this disinfecting material and fly repellent or destroyer to carcasses immediately upon their collection, and it also was being used about the plant. The statement made by the observer was that there was a practical absence of flies at said plant. I pay the compliment to Minnesota, for I have never visited a plant of that kind and seen any great absence of flies. The use of the repellent had for an object, in this instance, the overcoming of flies.

If you are experienced with the operating of such plants you will find, as they are usually operated, as operated in Nebraska, these plants may be about the greatest breeders of flies that can possibly exist. I am not acquainted with the use of the repellent in relation to anthrax, but I can see where the same could play an important part in the question of the fly hazard in anthrax situations to retard and prevent the development of that hazard preliminary to the burning or destruction of the carcass.

Dr. Derflinger: Mr. Chairman, from the information I have been able to find on flies as carriers of anthrax or some of the other infectious diseases, it really is not so important to keep the flies off the carcass except perhaps for a psychic effect on the owners of these cattle. At least in the work that has been done on it, in my personal experience, I did not find that flies had been able to transfer disease from the carcass to the live animal by bites, but they could, just at the time of dying or just before the animal died, when it was showing acute symptoms, transfer it to the other animals.

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This plant, in hauling carcasses from the field, was applying this disinfecting material and fly repellent or destroyer to carcasses immediately upon their collection, and it also was being used about the plant. The statement made by the observer was that there was a practical absence of flies at said plant. I pay the compliment to Minnesota, for I have never visited a plant of that kind and seen any great absence of flies. The use of the repellent had for an object, in this instance, the overcoming of flies.

If you are experienced with the operating of such plants you will find, as they are usually operated, as operated in Nebraska, these plants may be about the greatest breeders of flies that can possibly exist. I am not acquainted with the use of the repellent in relation to anthrax, but I can see where the same could play an important part in the question of the fly hazard in anthrax situations to retard and prevent the development of that hazard preliminary to the burning or destruction of the carcass.

DR. DERFLINGER: Mr. Chairman, from the information I have been able to find on flies as carriers of anthrax or some of the other infectious diseases, it really is not so important to keep the flies off the carcass except perhaps for a psychic effect on the owners of these cattle. At least in the work that has been done on it, in my personal experience, I did not find that flies had been able to transfer disease from the carcass to the live animal by bites, but they could, just at the time of dying or just before the animal died, when it was showing acute symptoms, transfer it to the other animals.

DR. CHARLES G. LAMB: Dr. Williams has referred to an outbreak of anthrax in a dairy. Recently I had a little experience of that kind in an extensive dairy supplying milk to a city of considerable size. We had an extensive outbreak of anthrax and there was some question as to where the infection came from. Anyhow the dairyman had quite an extensive outbreak of anthrax and very naturally his customers were in a panic. The city board of health took it up, the state board of health took it up, and he was quarantined and the milk supply was shut off.

Some of his sick animals responded very well to the serum treatment. What I want to find out is, when and under what circumstances a dairy can be given a clean bill of health by the officials, state or city, and permitted to resume the sale of milk? How long a period after the last death should elapse, or what other circumstances would influence Dr. Williams or others in permitting the dairy to resume its usual business, and with the assurance to the public which seems to be necessary that they will be absolutely safe in using the milk from this dairy?

DR. WILLIAMS: In our state that problem is one for the public health department. It does not come within the jurisdiction of the Live Stock Sanitary Commission of Texas. However, we instructed the owner of the dairy involved not to sell that milk, nor to let any of it get off his premises, but to dig a hole and put the milk in the hole just as he did the diseased animals.

A State Board of Health representative was in there a few days later, when a meeting was held at the City Hall. They were in possession of a letter from a veterinarian stating that it was almost impossible to transmit anthrax through the milk of a cow and that as far as the public health was concerned, restriction on the sale of milk from the dairy involved was not essential.

The dairyman informed us of his desire to sell the milk, but was advised not to do so; if he did that he would be prosecuted. When I visited that city they wanted to know what our object was in keeping that quarantine in effect against the sale of the milk. I told them on account of the seriousness of this case and inasmuch as three men had contracted the disease on the premises where postmortems were held. We did not know but what the milk-cans, milk-buckets and bottles, and other equipment were contaminated, and until that was decided we would continue to prohibit the sale of the milk from those premises.

There was a general clean-up, a real, thorough clean-up, in which the owner cooperated splendidly and at the end of seven days there had been no further losses and our objection was withdrawn. Later I called upon the State Health Officer and discussed that case with him. I explained that the letter he had did not apply in a case of this kind, that we did not believe that anthrax would ordinarily spread through the milk, because the animal affected would not be in milk because of high temperature, nor at any rate just before death when the milk might be infected, but that we would expect them to assume a supporting attitude and back us up in similar cases. He informed me that after they had reviewed the situation and one man had died, they were highly pleased that the Live Stock Sanitary Commission had taken the position that it did in that case.

I think it depends largely on the way the herd responds to the treatment and the thoroughness of the premise disinfection just when milk from an infected herd is safe to move.

DR. R. A. CALDWELL: The doctor said he did not know of any paper written dealing with flies as carriers of anthrax and other infectious disease from carcasses. If he will write to the University, he will find that was worked on by Dr. Harry Morris, at the time Dr. Dalrymple was there, and he will find he did transmit anthrax from carcasses of rats with flies. He shaved the bellies of mice and put the different kinds of flies on and did transmit anthrax from the carcass to these other animals.

Also, Dr. Dalrymple was the first man who had the wheel showing you the different avenues through which anthrax would spread, and the hub of this wheel was the improper disposition of the carcass.

DR. DERFLINGER: Mr. Chairman, I looked pretty thoroughly for something along that line and was not able to find it. I looked the reference up at the University of Oregon and they apparently didn't have this bulletin in their

files, and so I may have to back up from that statement about the dead animals, although I noticed in the description that Dr. Caldwell had given here he remarked about the special preparation of the skin. Of course the bovine animal has a little thicker hide and that may have something to do with spreading it from one to the other, because it seems the thin-skinned animals, the pure-bred bulls, were the first to die from anthrax.

I do not know of any other way in some of those instances that it could have been carried other than by flies. They were separated by water but the streams were narrow enough so that the flies could be blown across by the winds or could fly across to those animals.

As for the way we handle our dairies up there, the quarantine was placed by the city. It was our suggestion that they be quarantined for approximately three weeks from the last death that occurred on the ranch. I think we finally cut it down to two weeks, and it was merely because we felt there was an element of danger in the use of the milk from these herds, not that we knew positively that it would be carried, but we felt there was an element of danger present.

DR. WILLIAMS: We would not permit the sale of any milk from this herd. We maintained a quarantine of three weeks.

The fly is a very important factor in the spread of anthrax. The men who are dealing with it regularly look for the animal that is covered with flies. That animal is going to die in a very short time and he has lost his vitality to the extent that he can not fight the flies any more, and those flies are on there and the blood is oozing. As soon as that animal goes down, the flies are off and go to the other animals in the herd or onto other premises.

The boys state that is one of the principal reasons for the rapid spread at certain times. It is the deer fly, principally, with us.

DR. CALDWELL: I am in the anthrax country and do not know much about it, but we do know if we can move cattle infected with anthrax, take them away from this place and move them at night, there is much less infection than when we move them in the middle of the day and take the flies with us.

DR. J. P. IVERSON: This has been the most interesting discussion and a most valuable one. Probably we are justified in taking another minute or two with reference to the point brought up a minute ago concerning the disposition of milk in dairy work where anthrax is found.

Many years ago, in this state, we followed the method mentioned by Dr. Williams, refusing to permit the owner to sell the milk if the animals in the dairy were infected with the disease. We required at that time an interval of three weeks to elapse before the sale of milk would be permitted.

In later years, however, a practice has been followed here which in our opinion appears to be rather fair to the health officer, to the public, and to the dairy. (I might add here that the disposition of the milk and the dairy products in California properly come under the jurisdiction of the local health officer or the State Board of Health.) Where there is no unusual condition surrounding the appearance of anthrax in the dairy herd, the animals are treated and just at the time of each milking all of the animals have their temperatures taken and the milk is permitted to be used from those of normal temperatures. The procedure is followed before each milking.

We know that one of the principal symptoms of the disease is the development of fever and it has been felt this procedure will avoid a serious loss to the dairyman and give a large measure of protection to the consumer. It has been carried on in a general way for a number of years here in this manner, and the time the temperatures are taken has been reduced from three weeks or a month to a ten-day period.

DR. C. E. COTTON: In Minnesota, through the State Board of Health, we require a quarantine. We do not allow the milk to be used for a period of ten days after the symptoms of the disease have disappeared and the proper cleaning and disinfection of the premises has taken place.

DR. HAYS: Recently there has come to the attention of our office report of postmortem findings in the slaughter of swine at certain packing-houses under federal meat inspection, by which anthrax was disclosed in swine. These have involved cases at Omaha, Nebraska, also at Sioux City, Iowa, and

Sioux Falls, South Dakota. In each instance the anthrax was diagnosed only after slaughter; the animals had passed the usual antemortem inspection.

A very serious economic loss has been occasioned by reason of the cleaning and disinfecting required incident to the killing operations. The loss of the carcasses has not been great.

The diagnosis has been limited largely to macroscopic examination, but in a few instances microscopic and inoculation work has confirmed the diagnosis. Whether anthrax infection was present in all of these cases may be challenged, but we are impressed with the fact that there is a question involved which should receive further attention. We are impressed with the possibility of anthrax occurring among swine, yet producing lesions that may remain undetermined until such a postmortem examination reveals the same. The source of the infection is our great concern.

In so far as possible we have followed through investigation all reports to determine whether or not losses among swine may have occurred on premises at origin from which the swine affected came. These investigations have not borne any results other than negative. Our attention must be directed to the possibility of field cases of some proportion being the source of infection. It is a problem of live stock sanitation that must receive further attention.

German investigators have inc uired into a similar condition coming to their attention affecting swine. They found that anthrax to a measure comparable to the cases that have come under our observation were occasioned as a result of feeding fish meal or a combination of such feed as protein supplement. This is reviewed in certain German literature.

Ten Stations to Give "Read-the-Label" Talks

Beginning Thursday, January 8, W. W. Vincent, chief of the western district, federal Food and Drug Administration, will broadcast his weekly "read-the-label" talks through ten stations of the National Broadcasting Company, in six western states, according to Morse Salisbury, chief of the Radio Service, U. S. Department of Agriculture.

The new list includes: KTAR, Phoenix, Ariz.; KFSD, San Diego, KFI, Los Angeles, KPO, San Francisco, and KGO, Oakland, Calif.; KGW, Portland, Oreg.; KOMO, Seattle, and KHQ, Spokane, Wash.; KSL, Salt Lake City, Utah: and KOA, Denver, Colo.

The talks will be broadcast each Thursday at 9:45 a. m., Pacific time.

Commenting upon the Administration's series of "read-the-label" talks in a letter to Phillips Carlin, of the National Broadcasting Company, on December 5, Mr. Salisbury said:

"The series is a sustained attempt by the Administration to interpret for consumers the food and drug standards designed to conserve health and to protect from fraud the consumers of foods and drugs. These standards have been developed during more than 20 years of enforcement of the food and drugs act. Now the Administration is interpreting them, by radio, in terms that consumers may read and understand as a guide to their purchasing."

THE BACILLUS OF SWINE ERYSIPELAS ASSOCIATED WITH ARTHRITIS IN LAMBS*

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The original observations on which this report is based were made several years ago, but the identification of the organism involved was not completed until recently. At the time this paper was offered for the program of this meeting, I was not aware that the presence of the bacillus of swine erysipelas had ever been observed in sheep in this country, but in the July number of the JOURNAL of the American Veterinary Medical Association, Dr. J. D. Ray,[1] of the Kinsley Laboratories, reported finding *Erysipelothrix rhusiopathiae* in arthritis cases in lambs killed at Kansas City.

Although Dr. Ray's article is apparently the first publication in this country which records the finding of this organism in sheep, I find that several European workers have found the swine erysipelas bacillus causing disease in sheep. In 1913, Poels[2] described nine cases of polyarthritis in sheep in Holland caused by this organism. In 1914, Wall[3] reported similar cases. In 1919, Christiansen[4] reported an acute septicemia in very young lambs due to infection with the swine erysipelas bacillus. Spiegl,[5] in 1923, reported finding the erysipelas bacillus in the umbilical vein, synovia and lungs of two lambs, one week old, which had developed omphalophlebitis and polyarthritis. Krage,[6] in 1923, studied two outbreaks of septicemia in lambs from which he isolated the swine erysipelas bacillus. Reinhardt,[7] in 1924, described acute septicemia in adult sheep due to infection with the swine erysipelas bacillus. Biewener,[8] in 1924, described a chronic arthritis in lambs seven or eight months old, from the joints of which he isolated the swine erysipelas bacillus. Cornell and Glover,[9] in 1925, report an outbreak of arthritis in lambs in England, from which they isolated *Erysipelothrix suis*. Seddon and Carne,[10] in 1927, describe a specific arthritis in lambs in New South Wales, caused by an organism which they describe as similar to *B. pyogenes* and which may be the same organism which we have identified as *E. rhusiopathiae*. In a personal communication, I am informed by Gill, of New Zealand, that

*Presented at the sixty-seventh annual meeting of the American Veterinary Medical Association, Los Angeles, Calif., August 26-29, 1930.

there occurs in that country an arthritis in lambs due to an organism apparently identical with *Erysipelothrix rhusiopathiae*.

Occurrence of Arthritis in Lambs

Arthritis is not an uncommon condition in lambs, and is usually considered to be the result of navel infection. This disease is not a specific infection in all cases, as it has been found to be caused by various organisms. These non-specific cases usually develop within the first two months of the life of the lamb, and may cause a considerable death loss. There are also cases of arthritis which do not appear until the lamb is three or four months old, and are chronic in character, not resulting in death, as a rule, during the first year.

History of the Cases Reported

The cases from which we first isolated the swine erysipelas bacillus were of this chronic type. They occurred on a ranch where about 5,000 purebred ewes are bred. During the summer of 1925, several hundred of the lambs developed a stiff gait, and showed a lack of condition and proper growth. The lameness developed in some of the lambs when they were very young and in other cases did not appear until the lambs were about four months old. On November 6, 1925, two of the affected lambs were received for study at the laboratory of the Montana Livestock Sanitary Board, at Helena. They were held for observation. On November 16, one was killed for study, and on December 10, the second lamb was killed. On February 5, 1926, when the lambs were nearly one year old, two more of the affected lambs were shipped to the laboratory. One of these lambs was killed for study on March 23. The other lamb was held at the laboratory until February 3, 1927, when he could no longer stand, as a result of the chronic arthritis. On this date the lamb was killed, when he was nearly two years old.

Recently we have studied similar arthritis cases in a band of range sheep, and have isolated the same causative organism. In this instance lameness developed in a considerable number of lambs while on summer range. A lamb from this band was brought to the laboratory for study.

Symptoms

The symptoms observed in these cases were not complicated. The lambs gradually developed a stiff gait, those studied at the laboratory not being lame in any one leg, but appearing stiff in

all four legs. They had good appetites and appeared generally healthy, but they failed to develop properly and had a somewhat stunted appearance. The advanced cases had difficulty in rising from a recumbent position, and stumbled and fell easily if hurried. There was an enlargement of the affected joints, which was difficult to detect without handling the animal. They showed no elevation of temperature at the time when they were under our observation. The course of the disease was chronic. There were no deaths reported which were due to an acute infection.

Lesions

In two of the five lambs which were killed for study, no lesions were found outside of the joints of the legs. In two cases there were small white foci beneath the capsule of the kidney, and an inflammation of the mucosa of the urinary bladder. In the fifth lamb, the only lesion outside of the joints was an enlarged popliteal lymph-gland.

The joints involved in the five animals included all the principal joints of the fore and hind limbs except the hip joint. In one lamb only two joints showed lesions, the left carpus and the right stifle. Another lamb showed lesions in eight different joints, both scapulo-humeral and carpal joints, the left fore fetlock, both stifles and the right hind fetlock.

The affected joints in these cases showed a marked enlargement. The joint capsule was thickened and showed inflammatory tissue on the inner surface, which was continuous with vascular fringes resembling granulation tissue at the borders of the articular surfaces of the bones. There were petechial hemorrhages on the inner surface of the joint capsule. The joint capsule in some cases was distended with an excess of synovial fluid, which was turbid and contained small white flakes. There was no pus in the joints. Smears made from the synovial fluid were negative for bacteria, but showed large numbers of leucocytes. The articular surfaces in some of the lesions showed erosion, resulting in deep depressions and exposure of areas of roughened bone.

Cultures

Cultures were made from affected joints of five lambs, and from the enlarged popliteal lymph-gland found in one case. In all cases a pure culture was obtained of a bacillus whose cultural characteristics correspond exactly to those recognized as charac-

teristic of *Erysipelothrix rhusiopathiae*. Three of these strains were studied in detail and compared with a strain sent to me by Dr. Gill, of New Zealand. Dr. Gill had suggested to me that some of the cultural characteristics of the New Zealand strain were similar to those of the swine erysipelas bacillus. Not being familiar with that organism, I had failed to recognize the similarity of our organism to the swine erysipelas bacillus. Acting upon Dr. Gill's suggestion, we compared our organism and the New Zealand organism with the swine erysipelas bacillus, and found them identical. The following are the characteristics of these organisms as we found them. The carbohydrate fermentation reactions and the reaction on blood-agar plates are in addition to any data we could find on *Erysipelothrix rhusiopathiae*.

Morphology: Small slender rods, many of them curved. Many short chains. Chains frequently formed an S curve. Some chains showed several waves, like a spirillum, but each individual showed only one curve. Occasional filaments are observed. In the original cultures there was a tendency to a diphtheroid pleomorphism, but this disappeared in the second generation. The length of the majority of the organisms was between 1μ and 3μ, while the diameter was about .3μ. Strains that have been carried on artificial media for many generations show long filaments almost entirely. Smears from such cultures have the appearance of an entirely different organism from that found in smears from early cultures.

Motility: Non-motile.

Staining: Gram-positive.

Serum-agar colonies: Minute, circular, convex, colorless or white. We were not able to obtain growth on plain agar.

Serum-agar stroke: Scanty, diffuse, beaded, colorless. In a freshly isolated culture the growth is slow, starting at the base of the slope and extending between the medium and the wall of the tube, indicating a low oxygen requirement.

Gelatin stab: No liquefaction. Villous growth the full length of stab. The radiations after several days growth appear like tufts which are wider at the outer extremity, giving the "test-tube-brush" appearance.

Broth: A slight cloud is formed, with scanty, viscid sediment.

Litmus milk: A very slight acidity. No other change.

Coagulated blood-serum: Very scanty growth. No liquefaction.

Blood-agar plate: No hemolysis. Deep colonies are surrounded by a narrow greenish zone of methemoglobin production.

Indol: Not produced.

Fermentation: Acid is produced in dextrose, levulose, lactose, gelatose, and arabinose. No acid in sucrose, mannite, salicin, dextrin, maltose and glycerin.

Pathogenicity

Rabbits, guinea pigs, mice and lambs were used in pathogenicity tests. Two rabbits which were inoculated intravenously with the first strain isolated remained healthy. A rabbit inoculated intravenously with the strain from the range lamb died in five days. The only lesions found in this rabbit were in the kidneys, which showed a pitted appearance on the surface. The

organism was recovered from the heart-blood. Pathogenicity tests on guinea pigs gave negative results. Four strains were inoculated intraperitoneally into white mice. Recently isolated strains killed mice in two days, while strains which had been carried for many generations on artificial media required a longer time to kill.

Two lambs, one eight days old and the other nine days old, were inoculated intravenously each with a suspension in 1 cc of physiological salt solution of the growth on one 72-hour serum-agar slant. These inoculations were made on April 30. No effect was noticed until five weeks had passed. On June 4, one of the lambs was noticed to move with slight stiffness. No joint enlargement could be found. The stiffness has increased slightly and consists of a lack of freedom of motion of the hind legs. The abdomen is drawn up, and the lamb is not thriving.

On June 7, the other lamb was noticed to be lame in the right hind leg. By July 1, the lameness in this leg was very marked, and the lamb was using the leg very little. On August 16, the lamb was still lame, but the lameness did not appear to be as severe as in July. No enlargement of any joint could be detected by manipulation of the leg. It was decided to kill this lamb to determine whether the lameness was due to an arthritis caused by the organism with which the lamb had been inoculated. Autopsy showed the right stifle joint was slightly enlarged due to distension of the joint capsule with fluid and, when opened, the joint showed lesions similar to those found in the field cases. The joint capsule was somewhat thickened, due to inflammatory tissue on the inner surface. There were petechial hemorrhages on the inner surface of the capsule. The synovial fluid was increased in quantity, and was turbid, but there was no pus. The articular surfaces of the bones were not eroded. The tarsal joint also showed a slight amount of inflammation. No other lesions were found.

No bacteria were found in smears from the synovial fluid. Cultures were made from the fluid, and a few colonies developed on one of the serum-agar slants. There was also some growth in a tube of liver broth containing pieces of meat. Smears from the cultures showed pure cultures of *Erysipelothrix rhusiopathiae*.

The culture used for these inoculation experiments has been carried on artificial media for several years, and its virulence is probably reduced, as indicated by the mouse tests.

Portal of Entry of the Infection

The history of the cases of arthritis, in the outfit from which our original cases were received, indicates that the umbilical cord of the new-born lamb is the point where the original infection takes place. This is true also of various focal infections to which young lambs are susceptible. In order to test this theory, an attempt was made to infect the umbilical cords of six new-born lambs. The method used was to introduce into the open umbilical cord with a Pasteur pipette a suspension in physiological salt solution of the growth on a large serum-agar slant. This was done in from ½ to 4 hours after birth. Three of these lambs died within a few days from other causes. The other three are now three to four months old, and as yet there has been no evidence of any pathogenic effect. However, this experiment is not considered closed, and results to date should not be taken as proof that the infection in naturally occurring cases is not through the umbilicus.

Prevention

Preventive measures must of course be based on a knowledge of the causative agent and the means of infection. While in this instance we have as yet failed to prove experimentally that infection may take place through the umbilicus within a few hours of birth, there is good reason to believe that, like lamb arthritis from other causes, the portal of entry of the bacteria in arthritis cases due to *Erysipelothrix rhusiopathiae* is the umbilicus. If this be true, the method of prevention consists in lambing under sanitary conditions and the proper disinfection of navels where shed-lambing is practiced.

On the ranch where the cases reported here developed, navel disinfection was not practiced the year that the heavy incidence of arthritis occurred. Since that time all navels have been disinfected as soon after birth as possible, and arthritis cases have not developed. Tincture of iodin is the agent which we recommend for navel disinfection. It is important that this work be done thoroughly. It has been found that the application of the antiseptic agent with a swab is not satisfactory. We recommend that the disinfectant be used in a small wide-mouthed bottle or ointment jar, and that the umbilical cord be dropped into the bottle of disinfectant. The mouth of the jar is then held tightly against the abdomen of the lamb, and the lamb is tipped up, so

that the disinfectant comes in contact with all parts of the cord and the abdominal wall at the base of the cord.

Summary

Erysipelothrix rhusiopathiae has been found as the causative agent in two outbreaks of chronic arthritis in lambs.

Arthritis in lambs due to infection with this organism has been reported from Holland, Germany, Denmark and England. Recently the swine erysipelas bacillus has been reported from joints of lambs slaughtered in Kansas City.

The disease was reproduced in lambs by intravenous inoculation, but experimental umbilical inoculation has as yet failed to produce the disease.

On one ranch where the arthritis occurred, careful disinfection of navels has apparently prevented recurrence of the disease.

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For More Efficient Plowing

Even the plodding of plow horses will be speeded up to keep pace with our fast moving era, if British horse breeders succeed in the task to which they are now setting themselves. A team that can plow a 300-yards-long furrow nine inches wide can plow nearly two acres more during a month's work than can a team that plows only a 280-yards furrow in the same time. On a large arable farm this might amount to a saving of about $725 a year and might mean the margin between profit and loss under the new economic conditions. By mating active, free-moving mares and stallions that can sire progeny not merely able to move heavy loads but also able to move at a more rapid pace than is usual at present, the breeders hope to develop a plow horse capable of surviving competition of the machine age.

—*Science.*

THE REACTION OF THE FOWL TO PULLORIN*

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INTRODUCTION

The intradermal injection of microbial extracts in the diagnosis of disease probably began with the use of products derived from the tubercle bacillus. In 1917, Ward and Gallagher utilized certain products from the pullorum organism for the diagnosis of pullorum disease. Since that time numerous investigators have attempted to use similar products for this purpose. This paper is a report on some of the investigations we have been conducting for several years, with special emphasis on the reaction of the fowl to this type of treatment.

A satisfactory "pullorin" which could be used for the diagnosis of this disease in the field would be of great value to the veterinary profession. Such a test would eliminate the bleeding of the birds that is necessary for the agglutination test.

HISTORICAL

The historical review of the literature has been arranged in tabular form (table I). A glance at this table will show the type of product used and the relation of the pullorin test to the agglutination test. For obvious reasons the agglutination test has been used as the basis for comparison. This is necessary, since it is the only known method of detecting reactive birds in the breeding flock. The agglutination test is fairly accurate and will eliminate enough adult carriers of the disease to render the chicks, from the flock, pullorum-disease-free.

It is evident from the table that writers generally consider that the pullorin and agglutination tests have an average agreement of approximately 80 per cent. While some writers consider that such a test should be used, most do not consider that it should be substituted for the agglutination test. These points will be considered more in detail in the following discussion.

EXPERIMENTAL

1. *Pullorins used:* In the work of this laboratory numerous types of pullorin have been utilized. These are listed under four

*The data included in this paper were presented as part of a thesis for a master's degree at the Kansas State Agricultural College, in 1930, by Dr. C. A. Brandly. Contribution No. 134, Department of Bacteriology, Kansas Agricultural Experiment Station. Received for publication, July 14, 1930.

TABLE I—*Summary of pullorum investigations*

INVESTIGATOR	TYPE	AMOUNT INJECTED (CC)	TIME OF READING (HOURS)	CORRELATION TO AGGLUTINATION TEST (%)	CONCLUSIONS
Ward and Gallagher[1]	Broth culture	0.2	24 to 34	70	Equal to agglutination test
Scherago and Benson[2]	Broth culture	0.2	24 to 34	85	Lack of specificity
Fuller[3]	Broth culture	0.2	24 to 34	—	Detects large percentage of reactors
Dalling[4] *et al*	Broth cultrue	0.2	24 to 34	82	None
Dalling[5] *et al*	Broth culture	0.2	24 to 34	75	Useful
Broerman[6]	Washed cells, phenolized	—	28 to 30	—	Of value
Gwatkin[7]	Commercial	—	—	92	Agglutination test more satisfactory
Gwatkin[8]	Commercial (precipitated)	—	—	—	Agglutination test more satisfactory
Graham and Tunnicliff[9]	Precipitated	—	—	70	Of value
Edwards and Hull[10]	Commercial (precipitated)	0.04	24	78	Not reliable
Stafseth and Thorp[11]	Commercial	*	—	—	Inferior to agglutination test
Bushnell[12]	Ecto and commercial	ca. 0.1	24	85	Unsatisfactory substitute for agglutination test
Bushnell and Brandly[13]	Precipitated, cellular, ecto, digest	0.1–0.5	24	72	Unsatisfactory substitute for agglutination test
Bushnell and Brandly[14]	Precipitated, cellular, ecto, digest	0.1	24	79	Unsatisfactory substitute for agglutination test
Michael and Beach[15]	Cell solution	—	—	99	None
Edgington and Broerman[16]	Digest	—	—	*	See table Ia
Beach, Holmes and Strange[17]	Broth culture filtrate (concentrated)	2 to 3 drops	—	—	Cellular not satisfactory. Filtrate pullorins detected 12.3 per cent more *S. pullorum* culture-positive birds than agglutination test

*According to directions.

TABLE Ia—*Findings of Edgington and Broerman*[16]

GROUP	HENS	REACTION	CHICK MORTALITY	*S. pullorum* RECOVERED
I	24	A+P+	43.6	96.6
II	20	A+P—	60.6	88.1
III	27	A—P—	2.6	0.0

main groups: (1) a product precipitated from old broth cultures of the pullorum organism by alcohol, or a dried broth culture; (2) a cellular product obtained by centrifuging the organisms from broth or agar, either washed or unwashed with salt solution, or merely a broth culture sterilized by heat or chemicals; (3) an ecto-pullorin, which is a product obtained by dissociating the cell substance in salt solution; and (4) a substance obtained by digesting the cells with dilute alkali, followed by dilution and neutralization. Some of these products were concentrated, others unconcentrated. All were made sterile either by heat or chemicals. A description of the methods of preparation of each type will not be included, since the name given to each will indicate in a general way the methods used.

These four types of products have been used on about 8000 birds. Some of these birds were known to be carriers and some non-carriers of pullorum disease; some were of high titre to the agglutination test, some borderline cases, and some negative. The results are summarized in table II.

TABLE II—*Summary of results on use of pullorins*

	TESTS	CORRELATION WITH THE AGGLUTINATION TEST (%)
Precipitated pullorins	459	72.0
Cellular pullorins	582	86.5
Ecto pullorins	2330	82.7
Digest pullorins	4640	78.9
Total tests	8011	

The ecto pullorins are products that have a low toxicity, they are easily prepared, and are quite stable, but possess the distinct disadvantage of eliciting many reactions which are read as doubtful, or are indefinite.

The digest pullorins gave the next highest correlations. This product gave more clear-cut results than the ecto pullorin but

possessed distinct disadvantages because satisfactory stabilization and standardization were not accomplished.

The data on cellular pullorins indicate that these products are most satisfactory. However, a suspension of *S. pullorum* cells, although carefully washed to remove all extraneous material, may be considered a relatively crude product, which may be expected to give non-specific reactions. From our experiments with ecto and digest pullorins, products which may be considered as more refined, it seems that it will be difficult to improve them greatly and still have them reactive. Regardless of the high correlations given in these data we believe that the more refined products are superior.

Our results on precipitated pullorins were obtained by the use of commercial products. We have considered that the results obtained by use of such pullorins were no better than those obtained by use of the cheaper and more easily prepared products. For this reason we have confined our experimental work to three of the types mentioned above.

In considering the correlation to the agglutination test, the figures presented would indicate that the cellular pullorins are most satisfactory. We believe, however, that they are no more so than the others and are very likely to be less so because of their higher toxicity and resulting increase in non-specific reactions.

As has been mentioned in our earlier publications,[12,13,14] we have used the agglutination test as a basis for comparing the efficiency of our pullorins, since it is the only practical standard. For most of the comparisons reported in this paper we have used the rapid-serum method of Runnells, Coon, Farley and Thorp.[18] It has been found that this method correlates very closely to the tube method and possesses numerous distinct advantages over the other proposed methods.[19]

A review of the literature does not disclose any study made of the methods of injection of the pullorin. We have used an entirely arbitrary method of controlling the amount of material injected and this may be one of the reasons why we have not been able to obtain more satisfactory results.

The thickness of the wattle of White Leghorn and Rhode Island Red hens was determined by means of a special micrometer. The average was as follows:

Single Comb White Leghorn . . . . . 1.09 mm.
Rhode Island Red . . . . . 1.21 mm.

A histological examination of numerous normal tissues indicated that the average thickness of the skin is from one-fourth to one-third the thickness of the wattle, or about 0.27 to 0.36 mm. and 0.30 to 0.40 mm., respectively.

In order to determine the exact position of materials injected into the tissues of the wattles by the means usually employed in the pullorin test, a hen was injected with India ink. The bird was immediately killed and the wattle excised and prepared for histological examination. An examination of these preparations revealed that the material had been largely introduced subcutaneously and not intracutaneously. Serial sections made at the point of insertion of the needle indicate that a minute quantity of the material was deposited in the dermis during the initial puncture or during withdrawal of the needle. If the reaction is truly a dermal one, it must be assumed that minute quantities of pullorin may produce a marked reaction. Because of the highly vascular structure of the subcutaneous tissue, rapid absorption and removal of the pullorin by the general circulation must be expected and it is scarcely possible that it remains long enough in close proximity to the dermis to be absorbed in sufficient quantity to produce a reaction.

Figure 1 represents a microscopic cross-section of a wattle injected with India ink, with the 26-gauge needle in position.

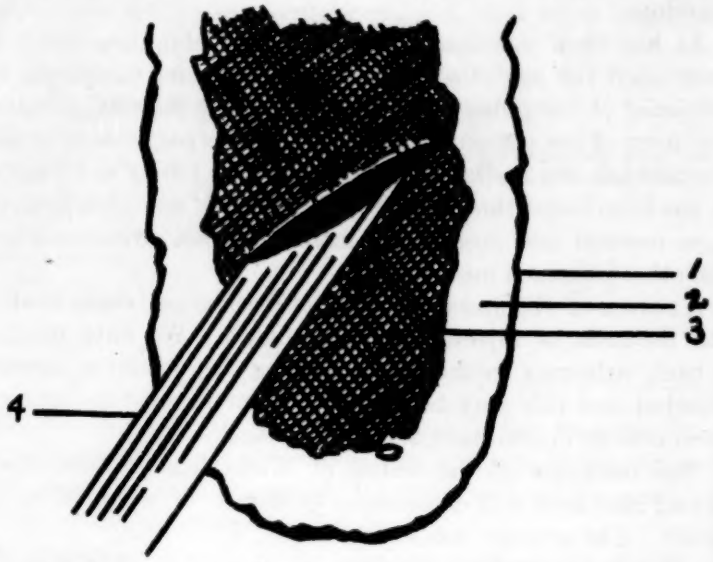

FIG. 1. Drawing of cross-section of injected wattle. 1, epidermis; 2, dermis; 3, India ink in subcutaneous tissues; 4, twenty-six-gauge needle in position during injection.

The drawing was made with a camera lucida and reproduced to scale.

The injection was considered satisfactory whenever an area of blanching of the skin 4 to 5 mm. in diameter, which persisted for a minute or more, and a nodule the size of a grain of wheat resulted. If too deep, the injections did not result in blanching and if too shallow the pullorin was lost, due to rupture of the surface tissues of the skin. To study this problem a flock of 43 birds containing 25 reactors to the agglutination test was selected and injected with an ecto pullorin. The injections were considered satisfactory in all but 7 birds, four agglutination positive and three negative, in all of which the injection was considered as too deep. The results of these tests are shown in table III.

TABLE III—*Results of deep injection of pullorin*

BIRD	AGGLUTINATION TITRE	PULLORIN REACTION (24 HRS.)
1	2560	4+
2	320	3+
3	320	3+
4	160	2+
5	0	0
6	0	0
7	0	0

In comparing these results with those obtained in properly injected birds, it is evident that the depth of injection had little influence on the response. In no case were the reactions in the latter group larger or more characteristic.

3. *Reaction to pullorin:* A histological examination of the wattle of a bird during a reaction showed a marked increase in intracellular fluid in the dermis and subcutaneous tissue. There was considerable dilatation of the blood-vessels, and leucocytic infiltration of the entire tissue, but especially of the perivascular areas.

According to the results of a study of the tuberculin reaction, the deeper the injection, as long as it is not subcutaneous, the more marked the reaction.[20] However, it is evident that very few of the injections into the wattle of a bird are intracutaneous, as will be explained later in this paper.

To study the response of the skin to pullorin, a group of known infected and normal birds was chosen. The results determined are shown (table IV) for an ecto pullorin.

TABLE IV—*Reaction to the intradermal injection of pullorin*

BIRD	AGGLUTINATION TITRE	MAXIMUM EARLY REACTION (HRS.)	MAXIMUM LATE REACTION (HRS.)	NATURE OF SWELLING	RESULTS OF PULLORIN
1	0	4	6	FT	Negative
2	0	2	10	FT	Negative
3	0	4	8	FT	Negative
4	0	5	6	FT	Negative
5	50	4	22	SE	Positive
6	100	2	26	H	Positive
7	100	2	22	SE	Positive
8	100	4	22	SE	Positive
9	400	3	22	SE	Positive
Average for non-infected birds	...	3.8	7.5	...	100% Negative
Average for infected birds	...	2.7	23.3	...	100% Positive

FT = firm, tense. H = hard. SE = soft, edematous.

The maximum early reactions were approximately the same in all birds and developed at about the same time. The maximum late reactions, however, showed great differences. For the non-reactors to the agglutination test, none of the swellings persisted much after 12 or 15 hours and most of them had reduced to normal before that time. In some birds there still persisted small hard kernels and discolored areas due to trauma, but these were much smaller than those seen in reacting birds. In birds positive to the agglutination test the maximum reaction occurred at about 23 hours. Another important point which is discussed later is that the reaction in the positive birds was considerably more marked than in the negative birds.

Observations were made on a group of birds to determine the persistence of the swelling. The results are shown in table V.

TABLE V—*Persistence of swelling of the wattle in pullorin reactions*

	NUMBER	%
Birds tested	47	
Pullorin positives	38	
Agreement between agglutination and pullorin tests		
Birds showing same reaction at 24 and 48 hrs.	14	36.8
Birds showing decrease in reaction at 48 hrs.	18	47.4
Birds showing positive at 24 and negative at 48 hrs.	3	7.9
Birds showing negative at 24 and positive at 48 hrs.	2	5.3
Birds showing increase in reaction in 48 hrs.	1	2.6

From these results we may conclude that the type of reaction produced by pullorin is similar to that due to tuberculin injected intracutaneously, although a number of differences are evident. In both infected and non-infected birds the early swelling is firm to the touch. In infected birds there is a later reaction which may be considered more specific, since it persists after the non-specific reactions have subsided. The persistence of the positive reaction is not constant after 24 hours. Sometimes it increases in extent and becomes more typical, but in most cases it gradually disappears after that time. The swellings have a peculiar smooth, soft, edematous "feel" which is also quite characteristic of a specific reaction. The early, firm, tense edema is almost always due to trauma.

Several normal and reactive birds were injected with a digest pullorin in order to determine the extent of the swelling which should be considered as positive, or at least significant. The results are indicated in figure 2. It is evident from these curves that there is considerable difference in birds which react and those which do not. Thus, in a general way we may consider a swelling which about doubles the thickness of a normal wattle as a positive reaction. The initial or non-specific swelling in the reactive group is somewhat greater than in the non-reactive group, although palpation in both cases does not indicate a great difference. The persistence of the reaction in the reactive birds characterizes a significant positive reaction.

It is quite possible that the persistence of the response will be different with different lots of pullorin and in different birds but, in our experience, the 24-hour reading will give the best correlation with the agglutination test.

A comparison of the titre of the serum of the bird with the results of the pullorin test was made in a flock of 56 birds. According to the agglutination test, four of these birds were non-reactors. The others were selected with reference to the titre of the serum. The results of this experiment are shown in table IV.

From these few figures it is evident that there is a much higher correlation between the pullorin and the agglutination reactions when the titre of the serum of the birds is high. This is an important point for consideration, since we have emphasized the value of removing the low-titre birds in work of eradication.[21] The limitation of the pullorin test is greater in this respect than is the agglutination test.

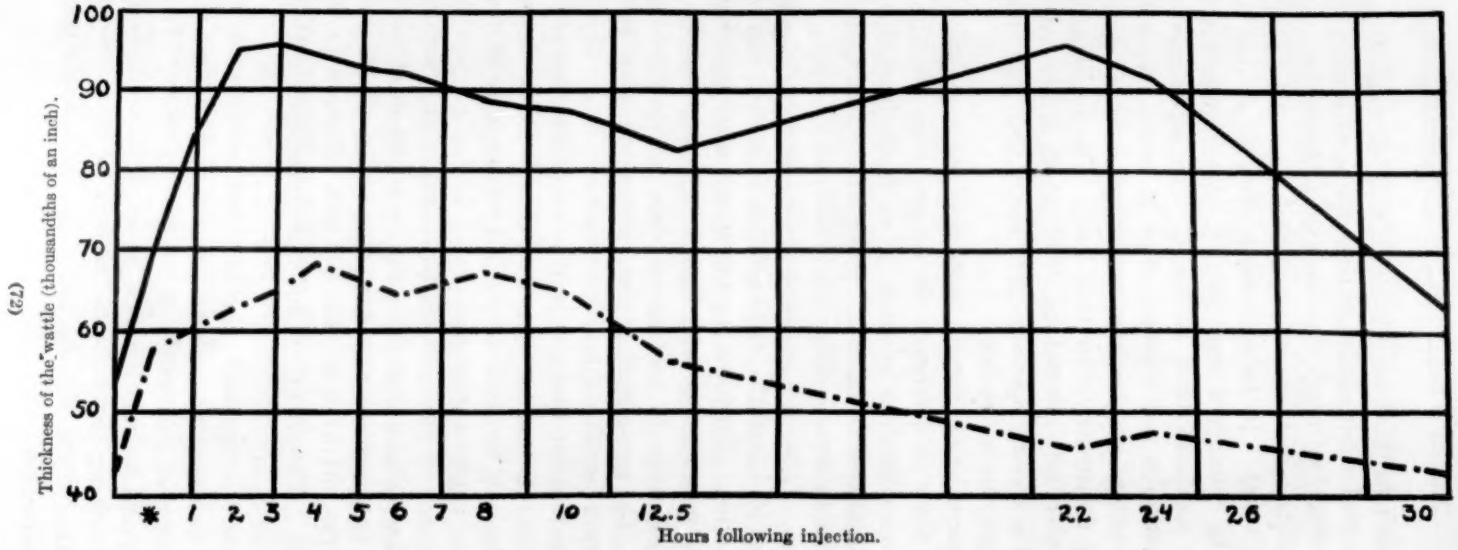

FIG. 2. Reaction curve of infected and non-infected fowl as measured by swelling of wattle.

★Post injection. — · — Non-infected fowl. —— Infected fowl.

TABLE IV—*Comparison of the agglutination titre of the serum with the pullorin reaction*

AGGLUTINATION TITRE	PULLORIN REACTION		TOTAL	PER CENT POSITIVE
	POSITIVE	NEGATIVE		
0	1	3	4	25.0
1:20	1	3	4	25.0
1:40	8	3	11	72.7
1:80	10	3	13	76.9
1:160	12	1	13	92.3
1:320	8	1	9	88.8
1:640	2	0	2	100.0
	42	14	56	75.0

A study was likewise made between the autopsy findings and *S. pullorum* cultures and the pullorin reaction. The data were obtained on 113 birds with the following results:

Positive to the agglutination test and positive to pullorin. . 71.6%
Positive for lesions and positive to pullorin. 87.7%
Positive for *S. pullorum* culture and positive to pullorin. . 76.5%

While these results are not free from error, they are probably as accurate as can be obtained from this type of experiment. It is interesting that about 87.7 per cent of the birds which reacted showed lesions of the disease, and 76.5 per cent yielded positive cultures. This is a high correlation when we consider the difficulties involved in making such examinations. The work of Edgington and Broerman[16] indicates that the presence of *S. pullorum* infection in chicks is a better basis for comparison than any other, and that the agglutination test gave results superior to the pullorin test.

4. *Use of different strains of S. pullorum:* Comparative tests were made on pullorins from different strains of the pullorum organism. Digest pullorins were made from cultures from adult birds and baby chicks, and from strains which were anaerogenic on glucose and those which were not. The percentage agreement with these products was very close in all tests and the conclusion is drawn that the strains of different origin furnish pullorins which act much alike.

5. *The effect of repeated tests:* To determine if one or more pullorin injections resulted in desensitization to subsequent injections of the same products, the following procedure was employed. A flock composed mostly of birds reacting positively to the agglutination test was pullorin-tested ten different times, extending over a period of six months. The results obtained

with ten of these birds are given in table VI. The complete results of the entire flock are not included for lack of space. However, they merely duplicate those here listed.

TABLE VI—*The results of frequent repeated tests with pullorin*

BIRD	ORIGINAL TITRE (5–20)	DATE OF TEST AND RESULTS						FINAL TITRE (11–8)
		5–20	6–15	7–2	7–3	10–2	11–8	
1	50	2	–	1	–	2	2	100
2	50	3	3	3	2	1	2	50
3	100	4	3	2	3	1	2	100
4	100	1	2	2	0	2	1	200
5	200	2	1	0	–	2	1	200
6	200	–	2	0	3	2	0	100
7	400	–	1	3	2	2	1	200
8	400	2	–	2	2	1	1	400
9	800	3	3	2	1	2	1	400
10	800	2	1	2	3	2	2	200

— = Not tested. 0, 1, 2, 3, 4, indicates increase in thickness of wattle compared to normal wattle.

These data indicate no perceptible or permanent desensitization following the use of pullorins although a few negative and irregular results were obtained. It is interesting that in most cases the birds with high titres in the beginning of the experiment showed a lower titre at the end, although none of them became negative. The reason for this is not known. The irregular results may have been due to the use of different serials of pullorin. Seven of these serials were used in this experiment, as the digest pullorins were noticeably affected by aging. From the results obtained we may conclude that the frequent injection of such products will not affect either the agglutination or pullorin reactions. Also that birds with high-titre agglutinating serum may occasionally react negatively to pullorin.

6. *Toxicity and potency tests:* To test the toxicity and potency of different pullorins an experiment was made, using four lots of digest pullorin. Such testing is considered necessary, particularly with digest pullorins which have aged. Some lots of old digest pullorins are satisfactory while others are not. The tests were made on birds known to be positive or negative to the agglutination test. The results are shown in table VII.

The results of this experiment are quite characteristic of those obtained by the use of these products. The results are variable on the same bird with different pullorins and on the same bird with the same pullorin at different times. The reasons for these discrepancies are not known. Such results, however, lead us to

TABLE VII—*Potency tests of digest pullorins*

BIRD	AGGLUTINATION TEST	PULLORIN TEST			
		LOT 42	LOT 43	LOT 44	LOT 45
1	+	+	0		
2	+	+	0		
3	+	++	+		
4	+	+++	++		
5	0	0	0		
6	0	0	0		
7	0	0	0		
8	0	0	0		
9	0	0	0		
10	0	0	0		
11	+			++	+
12	+			+++	++
13	+			0	+
14	+			++	+
15	0			0	0
16	0			0	0
17	0			0	0
18	0			0	0
19	0			0	0

look with more or less disfavor upon the use of these products in the field.

An attempt was made to add preservatives and stabilizing agents to certain pullorins. The results of a test on two such substances are shown in table VIII.

TABLE VIII—*Toxicity of buffered mixtures and glycerin solutions used in preparing pullorins*

BUFFER MIXTURES*			GLYCERIN SOLUTION IN 0.85% NaCl		
BIRD	pH	RESULTS	BIRD	% GLYCERIN	RESULTS
1	5.2	No reaction	7	5	No reaction
2	5.4	No reaction	8	10	No reaction
3	5.6	No reaction	9	15	No reaction
4	5.8	No reaction	10	20	No reaction
5	6.0	No reaction	11	30	Slight swelling
6	6.2	No reaction	12	50	Slight swelling

*Potassium hydrogen phthalate and sodium hydroxid.

These results show that the buffered mixtures were entirely non-irritating and that glycerin solutions of 30 to 50 per cent gave slight swellings, but would not be considered as significant. Properly buffered mixtures and glycerin to 20 per cent volume may be used in pullorins without affecting the reaction.

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7. *The double intradermal test:* The merits of the double intradermal test as compared with the one-injection test were studied on a few birds. This study was made in order to determine the value of repeated injections at short intervals in rendering the results more uniform.

After taking final readings on the single injection, certain birds were reinjected with pullorin by introducing the needle into the center of the area of swelling (if any remained) and injecting the same amount as originally used. When no swelling had persisted the injection was made as near as possible into the area previously injected. Nine birds were used, four negative and five positive to the agglutination test. The results for the first injection and the double injection are shown in table IX.

TABLE IX—*Results of double intradermal test*

BIRD	REACTION TO FIRST INJECTION*	REACTION 5 HOURS AFTER 2ND INJECTION	REACTION 22 HOURS AFTER 2ND INJECTION
1	0	0	0
2	0	+	+
3	0	0	0
4	0	0	0
5	+	+	+
6	+	+	0
7	+	+	0
8	+	+	0
9	+	+	0

*The results were determined by palpation of the wattle.

The data recorded in table IX indicate that the double injection is not so satisfactory as the single-injection method. Bird 2 which was previously negative to the pullorin as well as the agglutination test, gave a positive reaction to the double injection, while bird 5 was the only one positive to the three tests. There was apparent also a loss of tone in the tissues of the wattle following a decrease in swelling after five hours.

SUMMARY AND DISCUSSION

In the previous studies of this question the methods of application of the pullorin and the nature of the reaction, have not been adequately considered. An examination of histologic sections immediately after injection and of normal and reacting wattles has shown the immediate fate of the injected material and the nature and extent of the response of the tissues to pullorin. A summary of the results of these experiments indicates that further studies of methods of introducing pullorins into the skin,

with careful interpretation of results, will accomplish more than efforts directed entirely to the preparation of different pullorins.

The results with tests on pullorins employed in this work indicate that the best interpretation is obtained between the 20th and 24th hour after injection and that the double-injection method does not give uniform results.

The question of injury to the wattle should not be overlooked. Birds with frozen wattles cannot be tested with pullorin since the resulting swelling masks that due to pullorin. In certain flocks it has been observed that injuries resulting from catching birds in wire crates have caused swellings not distinguishable from a pullorin reaction.

Although the measurement of the increase in thickness of the wattle of reacting and non-reacting birds failed to establish the exact amount of swelling necessary to indicate the difference between a positive and a negative reaction, it brought out the fact that considerable swelling of the wattle may occur without it being perceptible to the touch. However, the measurement of the wattle does not always indicate the true nature of the reaction, inasmuch as the important characters of smoothness and tenseness of the skin, heat, edema, and "feel" can be detected only by palpation.

The application of toxicity and potency tests on all lots of pullorin shortly before using will eliminate many unsatisfactory products. However, the possibility of proposing exact standards seems distant.

Although the results given earlier in this paper indicate in a general way the relative merits of various products as compared with the agglutination test, it must be recognized that our standard of comparison is far from perfect and it is quite possible that under certain conditions the pullorin test is equally satisfactory. It is generally recognized that the agglutination test successively applied, with removal of the reactors, and followed by proper sanitation, will eliminate chick mortality as a result of this disease. Consequently any test which shows complete correlation with the agglutination test should equal it in efficiency. Up to this date the pullorin test has not been shown to be as effective and the evidence which we have points to the contrary.

The one serious difficulty in the field use of the pullorin test is the fact that too much is left to the personal judgment of the operator concerning the reaction. It is not always easy to decide when a bird is showing a reaction, and at present we do

not have enough factors under control to take the diagnosis out of the realm of guess work.

Conclusions

1. The very thin skin of the wattle of the fowl precludes the possibility of intradermal injection in many cases, with the methods generally employed.

2. The reaction to a single "intradermal" injection of digest pullorin is manifested by a non-specific early swelling in infected as well as non-infected fowl, which reaches its maximum size at three to four hours following injection, and a later specific reaction which attains its maximum size at an average time of 22.5 hours.

3. The character of soft edema with more or less severe swelling as detected by the touch is a more satisfactory criterion for interpretation of the reaction to pullorin than the increase in the thickness of the wattle as measured with the micrometer.

4. Macroscopically and microscopically the pullorin reaction resembles the tuberculin reaction as manifested in birds and other species.

5. Frequent repeated tests with digest pullorins do not cause significant desensitization of reactive individuals.

6. The ecto and digest pullorins used in these studies were more satisfactory than other types prepared in our laboratory or those obtained from other sources.

7. In an effort to develop a satisfactory pullorin, sources of variation in the test, including methods of application and standards of interpretation and comparison, must be given major consideration.

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THE ANTHELMINTIC TREATMENT OF INFESTATIONS OF THE BADGER WITH SPIRURIDS (PHYSALOPTERA SP.)*

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During the spring and summer of 1929, following the advance in price of badger fur, many persons in northeastern Montana engaged in trapping the animals, some with the view of keeping them until the fur was prime while others captured them for breeding purposes.

The establishment of a badger farm was begun at Four Buttes, Montana, with badgers captured during the summer and fall months of 1929. During this period there were collected about 100 badgers. On October 2, the writer was called to the farm to ascertain the cause of deaths among the badgers. Up to that time the loss had been quite heavy.

SYMPTOMS AND POSTMORTEM FINDINGS

Twenty-two badgers were observed to be very thin in flesh. Their fur was shaggy-looking and had completely lost its gloss. Animals in the last stages passed characteristic black, tarry feces. All were quarrelsome. This quarrelsome disposition is found also in underfed badgers. Some were badly scarred about the head from fighting. The badgers were found to be infested with worms, *Physaloptera* sp., and those in the later stages of infestation with these worms became weak and seemed paralyzed refusing all food with the exception of honey. The owner reported that two or three weeks before the animals became sick and emaciated, some of them had a very noticeable discharge from the eyes and nose, with an occasional slight cough, but this condition seemed to diminish when the floors of the pens and adjoining grounds were kept wet; the apparently non-infested badgers in the same pens did not show this condition.

Postmortem examinations on three badgers revealed a few ascarids present, but a spirurid, identified in the Zoological Division of the Bureau of Animal Industry as *Physaloptera* sp.,

*Presented at the twenty-second annual meeting of the Montana Veterinary Medical Association, Great Falls, Mont., July 25-26, 1930.

found attached to the esophageal region of the stomach in large numbers, seemed to be a major factor in causing trouble. The number of physalopterids found in the stomach of any one badger ranged from 150 to 200. From previous observations, the owner was of the opinion that up to that time the probable loss in badgers that could be attributed directly to the physalopterid was 20 head.

Treatment

Table I covers treatment used on 18 of the 22 badgers referred to previously. The estimated weight of these badgers was from 8 to 20 pounds each. They were not fasted before treatment as some were completely off feed and others ate very sparingly. Table II covers treatment used on two other lots. The first lot of 16 badgers were in fair condition, weighing from 12 to 25 pounds each, but all were considered infested. This opinion was based on the appearance of their fur, their thin condition, and their somewhat quarrelsome disposition. A few passed the characteristic black, tarry feces. The carbon bisulphid treatment was given, following a fast of about 20 hours. The second lot consisted of 30 badgers, which apparently were in good condition, weighing from 16 to 30 pounds each. All badgers were considered underfed. Results tabulated in tables I and II were obtained from personal observations and those of the owner, Mr. H. J. Kjos. Other activities prevented the writer from being present to check all results personally. Therefore, a large part of the data contained in the tables was furnished by the owner, who was keenly interested in the treatment and its results.

Method of Administering the Drugs

The badgers were caught by the tail. Thin badgers were caught with a rope attached to a pole and used as a snare. Next, a specially constructed tong with two sets of jaws was placed on the animal; one jaw around the badger's neck and the other around its chest. Most badgers opened their mouths readily in connection with the administration of the vermifuge with a balling-gun. For those that did not, a long-handled pair of pliers, with the jaws well wrapped with tape, was placed over the lower jaw well back, and with a firm grip and a downward and backward movement the jaw was forced open so that the vermifuge could be administered with a balling-gun. This method of restraint worked fairly well, except that in some cases the tong around the neck seemed to interfere with swallowing. It was

TABLE I—*Results from various anthelmintics used on 18 badgers*

Badger	Treatment			Worms Passed		Date of Death (1929)	Parasites Found Postmortem	
	Date (1929)	Drug and Dosage	Reaction	Ascarids	Physaloptérids		Ascarids	Physaloptérids
1	10–2	1/10 gr. arecolin; 40 min. later, ¾ gr. arecolin	Sick	4 alive	0	10–5	6 alive	Over 100 alive
2	10–2	½ gr. arecolin; 1 hour later, ¾ gr. arecolin	Very sick	12 alive	0			
	10–8	16 min. carbon tetrachlorid	Sick	0	0	10–9	3 dead	Over 100 alive
3	10–2	1 gr. santonin and 1 gr. calomel	None	0	0	10–6	0	Over 100 alive
4	10–2	1½ gr. santonin and 1½ gr. calomel; 4 hours later, ½ gr. of each	None	0	0	10–6	0	Over 150 alive
5	10–2	1½ gr. santonin and 1½ gr. calomel	None	0	0			
	10–8	32 min. carbon tetrachlorid	Sick	0	0	Killed 10–9	5 dead 5 alive	Over 150 alive
6	10–2	1½ gr. santonin and 1½ gr. calomel	None	0	0			
	10–8	16 min. oil of chenopodium	Very sick	0	0	10–9	7 dead	Over 100 alive
7	10–2	1½ gr. santonin and 1½ gr. calomel	None	0	0			
	10–10	15 min. carbon tetrachlorid and 4 min. oil of chenopodium	Very sick	0	0	10–11	3 dead	75 alive; mass of dead
8	10–2	20 min. oil of chenopodium	Very sick	0	0	10–3	0	Over 100 alive
9	10–8	8 min. carbon tetrachlorid	Sick	0	0	10–8	0	Over 150 alive
10	10–8	15 min. tetrachlorethylene and 4 min. oil of chenopodium	Very sick	0	0	10–9	0	Over 150 alive
11	10–8	16 min. carbon tetrachlorid	Very sick	0	0			
	10–17	15 min. carbon bisulphid	Slight stupor, vomited	3 dead	Vomited over 200 dead		No examination	No examination
	10–18			5 dead	0			
12	10–8	8 min. tetrachlorethylene	Sick	0	0			
	10–17	15 min. carbon bisulphid	Slight stupor	4 dead	Large mass dead		No examination	No examination

13	10–8	16 min. carbon tetrachlorid	Sick	0	0			
	10–17	15 min. carbon bisulphid	Vomited in 1½ hours	0	Vomited over 200 dead		No examination	No examination
14	10–8	16 min. carbon tetrachlorid	Sick, bloated	0	0			
	10–16	5 cc tetrachlorethylene	Dead stupor in 40 minutes. Died in 2 hours	0	0	10–16	0	Over 210 dead
15	10–8	16 min. tetrachlorethylene	Sick	0	0			
	10–17	15 min. carbon bisulphid	Slight stupor	5 dead	Large mass dead		No examination	No examination
16	10–8	10 min. tetrachlorethylene	None	0	0			
	10–17	15 min. carbon bisulphid	Slight stupor	0	Large mass dead		No examination	No examination
17	10–17	15 min. carbon bisulphid	Slight stupor	0	Large mass dead		No examination	No examination
18	10–16	20 min. carbon bisulphid	Stupor; vomited in 1½ hours	0	Vomited 193 dead			
	10–17			0	0			
	10–18			0	0		No examination	No examination

Badger 5 became very sick the following day, believed to have been caused by an overdose of carbon tetrachlorid. He was killed, as there seemed no chance for recovery.

Badger 10 is thought to have vomited the drug.

All badgers receiving carbon bisulphid were given a tablespoon of castor oil, to which a little honey was added.

Badgers not receiving carbon bisulphid were not given a cathartic, except as listed.

TABLE II—*Results of treating badgers with carbon bisulphid*

Badgers in Lot	Treatment		Badgers That Vomited Dead Physalopterids in 1 to 2 Hours	Badgers That Passed		Remarks
	Date (1929)	Drugs and Dosage		Ascarids	Physalopterids	
16	10–22	12 min. carbon bisulphid after fast of 20 hours.	3	7	16	Largest number of ascarids from one badger, 75. Largest number physalopterids, estimated over 200
30	10–24	12 min. carbon bisulphid	15	23	15	This lot was to have been put on an 18-hour fast, but checking up revealed that drug was administered on full stomach, which may account for the large number that vomited. Masses of physalopterids and from a few to large numbers of ascarids were found following treatment

The first lot of 16 badgers received a dose of castor oil mixed with honey about six hours after drug was administered.
The second lot of 30 badgers did not receive a cathartic following the use of carbon bisulphid.

found that the best method of handling badgers that were quite tame was to have an assistant catch them by the tail and place them on the ground. The person administering the drug then grasped the badger by the skin at the back of the neck, raised the head slightly and administered the drug with a balling-gun.

Results of Treatment

Arecolin hydrobromid, santonin, and oil of chenopodium seemed to have no effect on the physalopterids. Carbon tetrachlorid was not considered effective, although it may have killed some that passed unnoticed. Tetrachlorethylene in a large dose was 100 per cent effective, but also killed the badger, while in a 10-minim dose it was not considered effective. However, it was not given a fair trial. Carbon bisulphid was very effective against the physalopterids, but postmortem examinations were not made immediately following treatment to determine whether or not it was 100 per cent effective. There were no fatalities among the 54 badgers treated with carbon bisulphid. Capsules containing carbon bisulphid were crushed in the mouths of two badgers, causing asphyxiation, but they were revived by artificial respiration. Very marked improvement in the condition of the badgers treated with carbon bisulphid was noticed in a few days after treatment. They began to put on flesh and their fur resumed its natural glossy appearance. The treatment was not repeated on the 54 head treated. On March 1, the owner reported that there had been no losses among the badgers treated with carbon bisulphid. Castor oil in tablespoonful doses, to which a little honey was added, was given six hours after the administration of the carbon bisulphid to all badgers thus treated, with the exception of the second lot in table II which received no cathartic to clean the intestinal tract of dead parasites. Some badgers were off feed following the carbon bisulphid treatment, but this was overcome by feeding them honey.

Feeds and Feeding

The food of the badgers consisted of cooked oatmeal, cooked whole wheat, horse meat, and gophers. The feeding of gophers was discontinued when the badgers became sick. In eating the gopher, the badger chews the head, but the body is wallowed around in the mouth and swallowed whole, including the hide, thereby swallowing the parasites in or on the gopher.

Search for Intermediate Host

The life history of this species of Physaloptera is not known, but an intermediate host is undoubtedly necessary. As beetles have been reported as the host of one species of Physaloptera, a search for beetles was made. No dung beetles or other beetles were noticed in or around the cages, but they might have been overlooked or might have been present previously, the infestation perhaps being of several months' standing and the infection occurring in summer. In the wild state the badger is known to feed on various rodents, rabbits, grasshoppers, bugs and worms. A tick was the only external parasite found on the badgers.

In order to ascertain whether or not badgers were infested in the wild state, a postmortem examination was made on a captured badger six hours after death, on November 26. Four ascarids, from 8 to 10½ inches in length, were found and 253 physalopterids were removed from the stomach. This indicates that badgers in the wild state also are infested, as would be expected. This postmortem examination was made under very favorable conditions. The worms were scraped from the stomach-wall and washed several times with warm water. A large number of physalopterids were found by following this procedure and it is believed that if this method could have been followed at the badger farm, the number of physalopterids reported in table I would have been considerably greater.

On January 17, the owner reported that since the badgers were treated last fall, 9 more had been captured but were not treated for worms. Of these, one died about the first of January.

On March 7, Mr. Kjos "pelted" 30 head of badgers and disposed of the remainder. Up to that time they had not hibernated. He was of the opinion that this was due to what he considered the improper construction of the pens. The 30 badgers that were pelted consisted of 22 head which had been treated with carbon bisulphid and 8 head that were not treated. Of the 22 badgers that received the carbon bisulphid treatment, only 3 were found infested with Physaloptera on postmortem examination. Two badgers had 5 physalopterids each and the other one had 12. The 8 badgers not receiving carbon bisulphid treatment were infested with physalopterids in numbers from 51 to over 200.

Summary

An inspection of the results obtained with the various drugs shows the following:

Arecolin: In doses ranging from one-tenth to three-quarters of a grain, for total amounts up to 1¼ grains per animal, this drug removed from 40 to 80 per cent of the ascarids and none of the physalopterids. As arecolin is primarily of value for the removal of tapeworms, it does not seem promising for the removal of physalopterids.

Santonin: In doses varying from ½ to 1½ grains, for totals of 1½ to 2 grains, this anthelmintic failed entirely to remove either ascarids or physalopterids.

Chenopodium: In doses of 16 and up to 20 minims, this agent removed all the ascarids in one case, but failed to remove any physalopterids from either of the two animals treated.

Carbon tetrachlorid: In doses of 8 and 16 minims, this drug apparently removed all the ascarids in one case and none in the other where these worms were present, and failed entirely to remove the physalopterids. In a dose of 32 minims it appears to have killed 50 per cent of the ascarids present, but failed to remove the physalopterids in the one animal treated with that dose. The dose was considered too large.

Tetrachlorethylene: In doses ranging from 8 to 16 minims this agent failed to remove any ascarids or physalopterids. In a dose of 5 cc it appears to have killed all the physalopterids and also the badger treated. It is not considered so toxic for badgers as carbon tetrachlorid. It deserves further tests in doses of 20 to 32 minims.

Carbon tetrachloride and chenopodium: This combination, in doses of 15 minims of the former and 4 minims of the latter, removed all the ascarids and none of the physalopterids.

Tetrachlorethylene and chenopodium: These drugs, in doses of 15 minims of the former and 4 minims of the latter, failed to remove any physalopterids.

Carbon bisulphid: This agent appears to have been very effective in the removal of physalopterids, but unfortunately no postmortem examinations were made immediately following the use of the drug. Judging from the large numbers of these worms passed or vomited after treatment with carbon bisulphid, together with postmortem examination of 22 head of treated

badgers on March 7, the drug was very effective, and the fact that it removed large numbers after the failure of other drugs used, indicates its superiority to the other drugs for the doses used and the methods employed.

It was apparently quite effective in doses of 12 to 16 minims when given to badgers fasted for 18 to 24 hours and followed 6 hours later by a tablespoonful of castor oil mixed with honey, a mixture which badgers will eat readily out of a spoon. However, no ill effects were noticed when a cathartic was not given after the carbon bisulphid. Badgers refusing to eat after treatment may be given honey to restore their appetite.

It should be noted that purgatives were given only with carbon bisulphid and santonin. Arecolin, of course, is a purgative itself. It is possible that greater efficacy and less bad effects on the badgers would have followed with the other drugs if the animals had been given a purgative, and this is especially true of chenopodium, which is a constipating and depressing drug with which a purgative should always be used.

In this summary, worms are referred to as "killed" or "passed" whenever they were found dead in the animal. Such worms would evidently have been passed in a day or two had the animals lived two days longer.

Tri-County Veterinary Association

The veterinarians of Houston and Fillmore counties, Minnesota, and Winnieshiek County, Iowa, met and organized the Tri-County Veterinary Association, at Caledonia, Minn., the early part of November.

The first regular meeting was held at Mabel, Minn., with Dr. P. H. Riede acting as host. The second meeting was held at Preston, Minn., with Dr. O. H. Titterud as host. Dr. F. C. Kochendorfer, of Decorah, Iowa, will entertain the Association at the next monthly meeting.

Erratum

In the discussion of the paper by Dr. W. E. Frink, "Small-Animal Hospitalization," published in the December, 1930, issue of the JOURNAL, the remarks credited to Dr. J. Koch (p. 720) were made by Dr. N. D. Cash, of Santa Ana, Calif.

THE RAPID MACROSCOPIC AGGLUTINATION TEST FOR BANG'S DISEASE

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PREVIOUS WORK

In 1922 and 1923, Gwatkin[1,2] described a rapid macroscopic agglutination test for Bang's disease, using a heavy antigen and mixing it with an equal quantity of serum on a glass slide. The test was of value in establishing a herd diagnosis, but was not considered sufficiently accurate to replace the other tests for more careful work.

In 1926, Huddleson and Carlson[3] described a more exact method, employing dilutions corresponding to those of the regular tube test. In 1928, Huddleson and Abell[4] reported that the first antigen was too sensitive and that there was a considerable difference in the titres of a few samples of sera. They described the preparation of a more satisfactory antigen and considered, after several thousand tests, that this method was as accurate and specific as any other method employed.

Lienhardt and Kitselman,[5] in 1928, reported that the method of Huddleson and Carlson in their hands gave a disagreement of only 1 per cent, and considered this negligible for all practical purposes.

Palmer and Baker,[6] in 1929, concluded from the examination of 609 sera that the rapid test was just as accurate as the slow agglutination test for the serum diagnosis of Bang's disease. In the 609 samples, however, the rapid method gave 94 reactors against 83 in the regular test.

Damon[7] concluded that the rapid test was more sensitive than the slow. Numerous samples were diagnosed as positive by the rapid method that were, at most, only suspicious by the slow technic. Many samples were diagnosed as suspicious by the rapid method that were negative by the regular test.

Graham and Thorp[8] reported insignificant variations on 5702 samples tested. They pointed out that the sensitivity of the rapid antigen suggests the advisability of frequent checking with the standard tube macroscopic test, especially in partial reactions.

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They considered that it might be employed, according to their results, in routine diagnostic work without sacrificing accuracy.

Method Employed

We have employed our own method on many samples with reasonably good results and also have used the method of Huddleson and Carlson for rapid diagnosis on many occasions with excellent results, but always have given an opinion on the sample subject to correction by the regular test. In our opinion there are more factors to be controlled in the rapid method than the regular test which render the former less reliable for routine work.

We were able to compare only a limited number of samples during the past winter, the results of which are, in a general way, similar to those we have obtained at other times when comparing these methods.

The antigen was prepared as described by Huddleson and Abell and the method of examination was as described by these workers. The regular and rapid antigens were prepared from the same strain of *Br. abortus*. The former had a density equal to tube 1 of McFarland's nephelometer. The antigen was titrated against sera of known titres, with which a very close agreement was obtained. The dilutions employed in both tests were 1:25, 1:50, 1:200 and 1:250. In making the last dilution in the rapid test we are ready to admit the possibility of error, as a small quantity of undiluted serum was being handled. The discrepancies, however, are more serious than a difference in the last dilution.

Group 1: Nineteen samples from herd P were set up by the regular and rapid methods. All were negative.

Group 2: Fifty samples from herd T. Nine were not in agreement. These were negative by the rapid test. Three reacted in 1:50 and six in 1:250 by the regular test. In this case six undisputed positives would have been missed by the rapid method.

Group 3: Forty samples from herd D. All but one were in agreement. The difference in this one was slight, the sample producing agglutination in 1:50 by the rapid method while negative in all dilutions of the regular test.

Group 4: Twenty samples from herd J. Five were negative in all dilutions in the rapid test. Four of these showed complete agglutination up to 1:100 and one up to 1:50. There were minor

discrepancies in six others but these were as between positive and suspicious, four testing higher by the regular method and two showing more agglutination by the rapid test.

Group 5: Forty-three samples from herd K. All were negative by both tests.

Group 6: Twenty-eight samples from herd A. Five showed complete agglutination in 1:10 by the rapid test and partial in 1:25 by the regular test. One showed no agglutination by the rapid method and complete agglutination in 1:50 in the regular test. The herd sire, consistently negative before and since, showed complete agglutination in 1:50 and partial in 1:100 by the rapid method and was negative in all dilutions by the regular test.

Group 7: Twenty-eight samples from herd I. Twenty-three were the same in both tests. Of these, eight were positive and fifteen negative. Five were not in agreement. Three of these were negative by the regular test in all dilutions and gave partial or complete agglutination in 1:50 by the rapid test. One was partial in 1:50 by the regular method and complete in 1:100 and partial in 1:250 by the rapid test. One was negative by the former and positive by the latter method in all dilutions. This was the only serious discrepancy in this group.

Group 8: Thirty samples from herd P. All were negative by both methods.

Group 9: Twelve samples from herd W. All were negative by both tests.

Group 10: Fourteen samples from various sources. One was positive and the others negative. Both tests were in agreement.

One hundred samples were tested without the application of heat. Fifteen positives failed to show any agglutination by the rapid method. In addition to heat, agitation of the mixture and the area over which the fluid is spread appear to be factors that influence the amount of reaction manifested by the serum-antigen mixtures.

In these ten groups, comprising 284 samples, and omitting differences of suspicious as compared to positive and negative reactions, there were six samples in group 1 that were negative by the rapid test and positive in 1:250 by the regular method. Four samples were negative by the rapid test and positive by the regular method in group 4. In group 6 five samples gave a positive reaction (1:100) in the rapid test but were negative (a reaction of $\pm$ in 1:25) by the regular method. Such a reaction

is regarded as suspicious by some workers but with the antigen employed in our regular work we can classify it only as negative. The samples in question have remained negative on two subsequent tests.

Summary

Accepting the regular test as the standard, the rapid method showed no reaction with ten positive sera and gave a positive reaction with six negative samples, a difference of 16 in 284 (5.6 per cent). Including variations as between suspicious and positive, and suspicious and negative, 29 samples differed from the regular test (10.2 per cent).

In addition to these, one hundred samples were tested without the application of heat and 15 positives failed to show any reaction by the rapid method (15 per cent). Heat, agitation of the mixture, and the area over which the fluid is spread, appear to be factors that influence the amount of reaction manifested by the serum-antigen mixtures.

Acknowledgment

We desire to acknowledge the assistance of Mr. C. J. Sims, of this laboratory, in connection with this work.

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Abbott Laboratories and Swan-Myers Merged

Abbott Laboratories, of North Chicago, Illinois, have absorbed the Swan-Myers Company, of Indianapolis. Mr. R. M. Cain, president of Swan-Myers, has been elected a vice-president and director of Abbott Laboratories, in charge of sales.

The case of John Punneo, of Summum, Ill., charged with practicing veterinary medicine without a license, has been held over until the March term of court.

RECENT ADVANCES IN THE PHYSIOLOGY OF DIGESTION

III. The Ruminant Stomach

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Because the mucous membrane of the rumen, reticulum and omasum is non-glandular and the epithelium is of the stratified squamous type, these compartments are frequently regarded as esophageal dilations or proventriculi. Embryological studies[1] show, however, that such a view is erroneous; they are derived from the embryonic stomach and not from the esophagus. The rumen, reticulum and omasum may represent regions that have lost their gastric glands while undergoing extensive phylogenetic modifications in size and form caused by the coarse, bulky character of the food.[2]

MECHANICAL FACTORS

The mechanical factors of digestion in the ruminant stomach have received much attention recently from workers both in this country and abroad.[3-13] Only a few of the ideas emanating from these and other researches can be mentioned here.

Rumen: It is agreed by a number of observers that anything swallowed in a normal manner goes to the anterior dorsal sac of the rumen. A great deal of the heavier food quickly finds its way into the reticulum; the coarser, lighter ingesta collect in the rumen.

The material in the ventral sac is composed mainly of liquids and suspended solids. In the dorsal sac moist ingesta float on the liquids of the ventral sac.

The form in which hay is fed (whole alfalfa hay, ground alfalfa hay) seems to bear no relation to the amount of dry matter in the rumen. The form in which corn is fed (finely ground, shelled) appears to bear no relation to the path that it takes through the stomach. Whether finely ground or shelled, most of it can be found in the rumen of cattle fed shortly before slaughter.[14]

In a large number of cattle, Schwarte,[15] studying rumen contractions by palpation under conditions of eating, rumination

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and rest (that is, non-eating and non-rumination), obtained average rumen frequencies as follows:

During eating, 2.77 contractions per minute.

During rumination, 2.33 contractions per minute.

During rest, 1.82 contractions per minute.

Reticulum: The contents of this organ are made up of liquids and suspended solids. By its energetic rhythmic contraction and relaxation it pumps liquid or semi-liquid ingesta to and from the rumen. This ebb and flow of liquid has much to do with the disposition of the newly arrived food in the stomach.[3]

The reticulum assists in regurgitation by contracting just prior to the act. Thus an abundant supply of liquid in the region of the cardia is insured. This makes the act of regurgitation more readily accomplished.

Omasum: This compartment doubtless has a mechanical function, but the exact way in which it carries it out is unknown. The omasal ingesta, drier than those in the rumen and reticulum, show a moisture content of only 50 to 65 per cent. Such a low state of moisture is not favorable to digestive changes of a chemical character. It is usually believed that the solid material entering the spaces between the omasal laminae is ground by a simultaneous contraction and relaxation of adjacent leaves. Wester,[11] in his recent work, does not hold to this view. He found that the leaves stiffened, owing to the presence of food between them, but were otherwise passive structures. By palpation of the free margins of the leaves through the reticulo-omasal orifice, Dukes [16] was unable to obtain any evidence of their contraction. Furthermore, the work of Ewing and Wright[17] supports the view that the omasum is not the grinding organ that it is commonly supposed to be. In a study of the extent of comminution in the different parts of the digestive tract of steers, these investigators concluded that the amount taking place in the omasum was only 6 to 18 per cent of the total, and was no greater than the amount taking place in the abomasum. The amount occurring during mastication, including the remastication, was over 50 per cent of the total. Such grinding as does take place in the omasum is probably caused by general motility of the walls of the organ and not by special motility of the leaves.

The movements of the omasum are described as being peristaltic in character.[4]

Esophageal groove: The view that the esophageal groove in mature cattle is an important conduit for food, whether that

of eating or that of rumination, must be abandoned, because of evidence by direct examination to the contrary.[3,16] In the suckling calf, however, the condition is different. Here the groove does serve as a conduit for milk passing from the cardia to the reticulo-omasal orifice.[3]

Rumination: This term may be used to include regurgitation, remastication, reinsalivation and reswallowing.

The force concerned in the entrance of food into the esophagus in regurgitation is, according to the old work of Toussaint and the recent work of Bergman and Dukes,[12] negative intra-esophageal pressure produced by an aspiratory act of the thorax with the glottis closed. The rate of passage of the bolus up the esophagus is about 1.4 meters per second.[16] The studies of Schalk and Amadon[3] on the nature of the regurgitated bolus in cattle show that it is composed mainly of roughage. Grains enter into its make-up only to the very limited degree that they are accidentally caught in the spaces of the roughage. Therefore, about 50 per cent of corn kernels must pass through the animal in the intact condition; for it has been shown that only about 50 per cent is crushed during eating.

The remastication is much more deliberate than the first mastication. Fuller[18] found that cows when eating grain and silage made jaw movements at an average rate of 94 per minute; and, when eating hay, at an average rate of 78 per minute; whereas, when ruminating, the average rate was only 55 per minute. With average rations, more than one-half the comminution occurring in the alimentary canal of steers occurs in mastication, including the remastication.[17]

The rate of passage of reswallowed food down the esophagus is about 1.34 meters per second.[16]

Data of rumination: The total time spent daily in rumination varies considerably in different animals. Fuller[18] observed a minimum time of approximately 7 hours, a maximum of approximately 10.5 hours, and an average of a little more than 8 hours. Schalk and Amadon[3] found an average rumination time of a little less than 7 hours. Bergman and Dukes[19] have reported similar results. The rumination periods are remarkably evenly distributed over the 24 hours; no time of day seems to be especially preferred. The duration of periods varies from a few minutes to an hour or more. The average time devoted to a bolus is a little less than one minute.

The rate of passage of ingesta: Only slight information is available regarding the length of time food residues remain in the various stomach compartments. It is commonly believed that the rate of passage through the rumen is slow, whereas the rate through the other compartments is more rapid. These general views are supported by the work of Ewing and Wright[17] who, by a method based upon a digestion trial and a subsequent slaughter test, found that food residues remain in the different compartments for the following average periods of time: rumen and reticulum, 61 hours; omasum, 7.9 hours; abomasum, 2.8 hours.

Chemical Factors

Our knowledge of the mechanical factors of digestion in the ruminant stomach, although very incomplete especially as regards the omasum, is much greater than our knowledge of the chemical factors. There is no riper field for study in the physiology of farm animals than the chemistry of digestion in the ruminant stomach.

Reaction of ingesta: The reaction of the rumen contents of the ox[20] is always alkaline. The average is pH 8.89. This constantly alkaline reaction, in the face of probable acid-production from carbohydrate fermentation, is explained by the high alkali content of the saliva of ruminants.

The average reaction of omasal contents[21] is just on the alkaline side of neutrality, and is pH 7.2.

The reaction of abomasal ingesta[22] varies between pH 2 and 4.1.

Digestive changes: Because the three anterior stomach compartments are devoid of glands, they supply no digestive secretion to the food. Furthermore, the saliva of ruminants contains no amylase. Hence, the chemical changes taking place in the rumen, reticulum and omasum, whatever they are, must be caused by microörganisms, plant enzymes or both. In the abomasum, however, a gastric juice is secreted that is similar in composition to mammalian gastric juice in general.

(*a*) *Rumen and reticulum:* It is not possible at the present time to say definitely which is more important in bringing about chemical changes in the rumen and reticulum—microörganisms or plant enzymes. It is probably a safe assumption, however, that microörganisms are chiefly concerned. Of these, bacteria are known to be important; and it is thought by some that infusoria are implicated, although recent work does not support this view.[23]

The best known and probably the most important chemical change taking place in the rumen is the degradation of cellulose, the chief constituent of crude fiber. The attack on cellulose is generally regarded as being bacterial in nature; there is no known enzyme produced by vertebrates that will act on this substance. There is, however, no unanimity of opinion as to the end-products formed. The time-honored view is that the end-products of use to the animal body are fatty acids of the lower series, mainly acetic and butyric. Recently, however, a good deal of evidence, mostly of an indirect nature, has been brought forward to the effect that the valuable end-product is glucose.[24,25]

The rumen is not an important organ of protein digestion. This is indicated by the small amount of uncoagulable (digested) protein found in it.[26]

(*b*) *Omasum:* Digestive changes of a chemical nature take place here only to a limited degree.[26] The low moisture content of the omasal ingesta (50 to 65 per cent) is doubtless an impeding factor.

(*c*) *Abomasum:* Gastric juice is secreted by the glands of the abomasum. The available evidence indicates that it is similar in composition and action to mammalian gastric juice generally. Table I shows the composition of the gastric juice of ruminants

TABLE I—*Composition of gastric juice of ruminants*

	DRY MATTER (%)	ASH (%)	HCl (%)	AUTHOR
Goat	1.142	0.84	0.044	Grosser[27]
Calf	0.35–0.50	0.17–0.238	0.13–0.356	Belgowski[28]

as obtained from experimentally produced fistulous pouches.

Bickel [29] also has studied the secretion of gastric juice from a Pavlov pouch of a goat.

Gastric lipase is practically absent in ruminants.[30]

The water content of abomasal ingesta is 80 to 90 per cent.[26]

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Fungi Thrive at High Temperatures

Temperatures that ordinary animals and plants could not endure for more than short periods are built up and apparently enjoyed by the fungi that breed in piles of rotting straw. Experiments at the Rothamsted Experimental Station, near London, show that these organisms of decay thrive best at a temperature of about 130 degrees Fahrenheit, which is more than halfway from freezing to boiling point. These fungi, it has been found, do more than the bacteria often found associated with them towards the reduction of straw to a soil-enriching fertilizer resembling farmyard manure.

—*Science.*

The eohippus, the primeval ancestor of the horse, was only a few inches high. He passed out, however, before he could be utilized in peewee polo.

—*Arkansas Gazette.*

THE EFFECT OF FOWL- AND PIGEON-POX VIRUS VACCINATION ON EGG-PRODUCTION

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Oregon Agricultural Experiment Station

Fowl-pox virus has been used in America for several years to immunize chickens. The *follicle*[1] and *stick*[2] methods have been the most widely used.

Fowl-pox virus as an immunizing agent greatly exceeded others previously used in this country but was not particularly advised for laying stock. Table I shows that fowl-pox virus may be

TABLE I—*Egg-production of laboratory fowls vaccinated with fowl-pox virus*

FLOCK 1 FOWLS[1]		FLOCK 2 FOWLS[1]		EGG-PRODUCTION[5] AFTER VACCINATION		
FOWLS VACCINATED 10-16-28[3] ONLY	FOWLS VACCINATED 10-16-28[3] AND 4-29-29[3]	FOWLS VACCINATED 4-29-29[3] ONLY	TAKES[4]	1 TO 14 DAYS (%)	15 TO 28 DAYS (%)	1 TO 28 DAYS (%)
10[6]	20[6]	20[6,7]	None	66	66	66
			4M	69	64	67
			4T	61	39	50

[1]Flocks (S. C. W. Leghorns) 1 and 2 were combined April 23, 1929.
[2]One stick per fowl and a take produced for each.
[3]Four sticks per fowl.
[4]Takes from April 29, 1929, vaccination.
[5]Egg-production following April 29, 1929, vaccination.
[6]No deaths during 28 days following April 29, 1929.
[7]Three deaths occurred on 29th day after April 29, 1929, vaccination.
4M = Four mild takes typical of fowls previously vaccinated or having had natural pox on each fowl.
4T = Four takes typical of highly susceptible fowls on each fowl.

used without highly disastrous results to egg-production. Although the previously vaccinated fowls produced 34 per cent more than the highly susceptible ones, the latter maintained an average of 52 per cent for the 28 days following vaccination. Production for 14 days after vaccination was 63 per cent and for the 15 to 28 days, 41 per cent. Since the period of lowest production occurs during the first month, the tables do not include a longer period with the exception of table II, which includes three

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types of flocks—molting hens coming into production, pullets producing for months but recently in a partial molt, and pullets coming into production for the first time.

Investigations[3,4] have demonstrated pigeon virus effective for fowl-pox control. To determine its application locally, a flock of 400 fowls was vaccinated—50 in lay, with pigeon virus and the remainder, including 100 in lay, with fowl virus. Table III includes representative data on this flock and shows that the fowl virus caused a decided drop in production and the pigeon virus permitted a high rate. The possibility that the pigeon virus was responsible for a decrease in production can not be elim-

TABLE II—*Egg-production of commercial flocks vaccinated with fowl-pox virus*

FLOCK	VACCINATION			EXAMINATION FOR TAKES		AVERAGE PRODUCTION (%)			
						DAYS BEFORE VACCINATION	DAYS AFTER VACCINATION		
	FOWLS	DATE	STICKS PER FOWL	FOWLS	TAKES (%)	1 TO 14	1 TO 14	15 TO 28	29 TO 42
3	408[1]	12–16–29	1	..[2]	..[2]	28	34	33	48
4	175[3]	2– 3–30	1	27	100	49	59	54	..[5]
5	235[4]	8–20–30	1	27	93	..[5]	27	21	35

[1]S. C. W. Leghorn hens in molt. Twenty-six fowls died, from all causes, during 49 days following vaccination. Per cent production is based on 408 fowls, as there were no records as to mortality dates.

[2]Owner reported over 75 per cent takes. Fowls had shown no pox previous to vaccination and virus was of same lot used for flock 4.

[3]S. C. W. Leghorn pullets. No exact record of mortality but very few died. Per cent production is based on 175 fowls.

[4]S. C. W. Leghorn pullets coming into production. Cannibalism claimed 25 by October 23. Per cent egg-production determined on basis of 235 fowls.

[5]Egg records for this period incomplete.

inated. During the thirty days after vaccination, the 20 pigeon-virus fowls averaged 68 per cent, 76 per cent for the first fifteen days and 60 per cent for the next. The 20 fowl-virus fowls during these respective periods averaged 40, 65 and 16 per cent.

The author is indebted to Dr. J. R. Mohler for the pigeon-pox virus obtained from the Ministry of Agriculture, England.

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TABLE III—*Egg-production of fowls*[1] *vaccinated*[2,3] *with pigeon-pox virus as compared with others vaccinated with fowl-pox virus*

VIRUS	BAND NUMBER	DAILY EGG-PRODUCTION BEGINNING THE DAY AFTER VACCINATION																													TOTAL 30-DAY PRODUCTION
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Pigeon	4	1	1	1	1	1	1	1	0	1	0	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	13
	5	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	0	0	25
	6	1	1	0	1	1	1	1	0	0	1	0	1	1	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	21
	16	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	0	23
	17	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	0	0	1	0	1	0	1	1	0	22
	19	1	0	0	1	1	1	1	0	0	1	0	1	1	0	1	0	1	0	1	1	0	1	0	1	0	1	1	0	1	0	17
	20	1	0	1	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	24
	22	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1	1	1	1	0	1	22
	25	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	25
	32	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	26
	35	1	1	0	1	0	0	1	0	0	0	0	1	1	0	1	1	1	0	1	1	1	0	0	1	1	1	0	1	1	0	17
	41	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	24
	43	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
	47	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	26
	48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	0	1	1	1	1	27
	51	1	1	1	1	0	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	18
	53	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
	54	1	1	0	1	0	1	1	1	1	0	1	1	0	0	0	1	0	0	0	0	0	1	0	0	1	1	1	0	0	1	15
	55	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	0	1	1	0	1	1	0	0	21
	58	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	1	0	24
		19	17	16	19	11	16	19	15	15	13	14	17	12	12	14	16	11	14	9	14	12	14	8	14	12	11	11	14	12	7	408

Virus	Band Number	Daily Egg-Production Beginning the Day After Vaccination																													Total 30-Day Production
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Fowl	3	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
	7	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
	8	0	1	0	0	1	1	0	1	0	0	0	1	1	0	1	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	11
	14	1	0	1	0	0	1	0	0	1	0	1	1	0	1	1	0	0	1	0	1	1	0	1	0	1	1	0	1	1	0	16
	15	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
	18	1	1	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
	21	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
	23	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	17
	26	0	1	0	0	1	0	0	1	0	0	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	0	0	0	0	15
	33	1	1	1	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
	36	1	0	0	1	0	1	1	0	0	1	1	0	1	1	1	0	1	1	1	0	1	1	0	0	1	0	1	1	1	1	19
	40	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	42	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	15
	44	0	1	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
	46	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
	49	0	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	14
	50	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
	52	1	1	0	1	1	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
	56	1	1	1	1	0	1	1	1	1	1	0	1	0	0	0	0	0	0	1	1	0	1	1	0	1	0	0	0	0	0	15
	57	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
		16	17	13	14	15	14	14	14	12	15	10	12	11	9	10	7	3	5	6	3	3	2	4	1	4	2	1	2	3	1	243

[1]A flock of 400 fowls (S. C. W. Leghorns), 350 vaccinated with fowl-pox virus and 50 with pigeon-pox virus. The table includes 20 representatives of each.
[2]The stick method (one stick per fowl) was used with fowl-pox virus and scarification method (average of 11 follicles per fowl) with pigeon-pox virus.
[3]Twenty-four vaccinated with pigeon-pox virus and 42 with fowl-pox virus were examined the eleventh day after vaccination and all showed takes.
1 = One egg.
0 = No egg.

ASPHYXIA IN THE NEWBORN PUPPY

By THOMAS J. GASSER, *Malvern, Pa.*

On numerous occasions I have been confronted with the almost hopeless task of attempting to restore respiratory equilibrium in the newborn puppy. I would judge from my own personal experience that more than five per cent of the puppies whelped are either born dead or die shortly after birth. Everyone knows that many a potential champion has passed on at birth, for want of suitable means of resuscitation.

Realizing that accidents of labor and malformation were usually beyond veterinary skill, I directed my efforts to saving the stillborn puppy. Toxemia of pregnancy and prolonged or difficult labor seem to be the most frequent causes of stillbirth. Manual methods of resoration do not give the desired results. Various medicaments have proved equally unsuccessful.

Obtaining an infant lungmotor, I devised a suitable mouthpiece, and in the first six cases upon which I used it, five responded. The one failure was due, I believe, to injury, as it was delivered with great difficulty. The quickness with which the puppy reacts to the action of the lungmotor is hardly believable. Results were obtained in from approximately one to four minutes. The apparently lifeless form becomes a sturdy pup full of the breath of life.

The normal rate of respiration in puppies averages about 50. Close observation showed this rate to decrease to 46 one hour after birth. The lungmotor in the six cases above mentioned was stroked as near 50 per minute as possible.

Briefly, the infant lungmotor is readily adjustable to three sizes, the smallest giving two and one-half cubic inches of air. It is fitted with safety regulators which prevent any possible excessive pressure from being created in the lungs and any suction action on the lungs. Using the smallest stop on the lungmotor,

I will say that I observed no harmful results in the cases mentioned above. I could notice no ballooning of the body nor was there any evidence of hemorrhage from the lungs.

I have yet to use this instrument on purebred calves or foals, but I can see no reason why it should not be the means of saving cases of asphyxia in the newborn of larger animals as well as of dogs.

ANAPHYLAXIS (?) IN A MULE

By JAMES R. WEST, *Milford, Del.*

At 10 o'clock in the evening, September 10, I was called a distance of thirty-eight miles to see a mule which the owner informed me had been down about fifteen hours. I diagnosed botulinus poisoning, commonly known throughout the Del-Mar-Va Peninsula, where this condition is prevalent, as blind staggers, or forage poisoning.

No treatment was administered to the prostrated mule, but the owner was advised to immunize three remaining mules with botulinus antitoxin. The first mule to be immunized was seven years of age. Immediately upon inserting a needle into the jugular vein, the blood spurted out for a distance of perhaps two feet, which is very unusual, but no particular significance was given this phenomenon. A dose of forty cubic centimeters of antitoxin was given and almost before I could withdraw my syringe and needle, the mule reared upon his hind legs and fell completely backward, falling upon the already prostrate mule and rolling over with his feet against the side of the barn. The whole body was seized with tetanic spasms, his feet tapping upon the boards in spasmodic contractions. The owner, of course, thought I had two dead mules instead of one, and so did I.

In one or two minutes the tetanic convulsions began to subside. In five minutes the mule was upon his sternum and attempted to rise but fell back. He was on his feet in about ten minutes, although somewhat unsteady. I had the owner walk him about fifty yards and he completely recovered.

Upon questioning the owner I found that this mule was unable to work all day. He would become exhausted and sometimes almost fall in harness. He perspired profusely, even with slight exercise. Upon examining the heart with a stethoscope, a distinct murmur could be detected. Also a dicrotic pulse was present.

This shock was naturally attributed to the cardiac insufficiency. Whether the supposition that the shock was anaphylactic in character was justifiable or not I do not know, but it was a rather difficult matter to explain to the owner. The antitoxin used was of equine origin and the mule had not received any injection of serum previously.

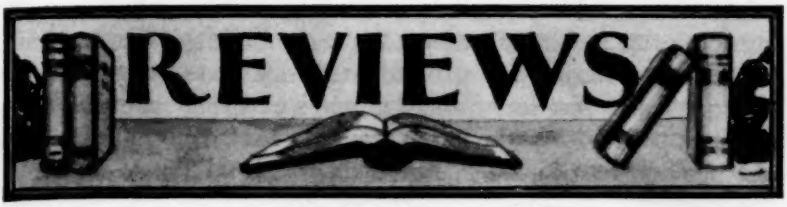
Tuberculosis Eradication Aids Public

Greater economy of production from cattle herds and increased prices for surplus breeding stock are among the important advantages resulting from the eradication of bovine tuberculosis in the United States. The most practical methods of detecting the disease in cattle, together with suggested means of control and eradication, are fully discussed in Farmers' Bulletin 1069-F, Tuberculosis in Livestock, just issued in revised form by the U. S. Department of Agriculture, Washington, D. C.

In addition to the economic benefits, there is added protection for the human family when milk is obtained from herds that are free from tuberculosis, the bulletin shows. A large proportion of the tuberculosis in the human family, especially among children, is now recognized as the result of the consumption of raw milk or other dairy products from tuberculous cows. Proper pasteurization of milk destroys the living organisms of tuberculosis, but much of the milk consumed daily is not pasteurized and, therefore, is a source of danger to those who use it.

Tuberculosis is usually slow in developing, and since its symptoms are not easily recognized from the outward appearance of the animals, many people believe that it does comparatively little damage to live stock. The loss from tuberculosis, however, is one of the heaviest taxes imposed on the live stock industry of the United States.

The principal methods by which tuberculosis spreads from a diseased herd to a healthy one are described in the bulletin. The first and perhaps the most important method mentioned is the addition to a healthy herd of one or more animals affected with the disease. Feeding calves with raw milk or other dairy products from tuberculous cows, shipping cattle in cars which have recently carried diseased cattle and which have not been disinfected properly, and grazing cattle on community pastures where tuberculous cattle have been allowed to graze, are other ways in which the infection spreads. Copies of the bulletin may be obobtained from the U. S. Department of Agriculture, Washington.



DIE PARASITEN, PARASITÄREN UND SONSTIGEN KRANKHEITEN DER PELZTIERE (PARASITES, PARASITIC DISEASES AND OTHER DISEASES OF FUR ANIMALS). Ludwig Freund. 229 pages, with 70 text figures. M. & H. Schaper, Hannover, Germany, 1930. Unbound, 13 marks; bound, 15 marks.

During the past year the reviewer has on various occasions invited the attention of veterinarians to the diseases of wild animals as presenting a field of veterinary activity to which more attention should be paid, in view of the probability that it will be increasingly important in the future. In the past quarter of a century, a veterinary practice that dealt mostly with horses has changed its character, and cattle have taken the lead in practice. It is still true that too few veterinarians are interested in diseases of sheep and poultry or informed in regard to them, and before we realize it we shall be confronted with a demand for much more information in regard to captive fur animals, game animals, game birds, and various other animals in zoological parks. This will follow from the intrinsic interest in and importance of these things and from the relation of diseases of wild animals to diseases of domesticated animals.

To meet this demand the veterinarian of the future must be, among other things, a zoologist. If we cannot lengthen the curriculum of the veterinary college or its preparatory course, we shall have to curtail the time spent on such subjects as the muscular and skeletal systems of the horse, and put in courses in advanced zoology and the comparative anatomy of the vertebrates. The veterinary curriculum must justify itself by its usefulness in its subsequent application in veterinary practice, and while a sound knowledge of osteology and myology was once of prime importance in the diagnosis of lameness in the horse, this matter is now too small an item of veterinary practice in general to warrant the present expenditure of time on these

things. A sound training in parasitology is becoming of increasing importance in practice and we must meet this need. Similarly, if the veterinarian is to deal with sick foxes, skunks, ducks and quail, he must know these animals and their habits. Sickness is a pathological deviation from the normal in animals, and one must have a knowledge of the normal if he is to recognize the abnormal.

A large number of animals, notably foxes, are now in the transition stage between that of wild and that of domesticated animals which may be termed semi-domestication; these animals are commonly designated as captive animals. The indications are that as our continent becomes more heavily populated, more and more of these fur-bearers will be raised in captivity and fewer of them will be shot, trapped or poisoned in the wild. A number of veterinarians are already engaged wholly or partly in supplying veterinary services for such animals. One of the difficulties with which the veterinarian has been confronted is that of securing information as to the diseases of these animals. Allen and McClure (1926) have supplied a valuable work in the English language on the fur fox, and this is the only comprehensive work of the sort up to the present time.

We now have the first European work on the diseases of the fur-bearers in general. Freund's book is in German and to those who read German it will be of great value. It furnishes information of use to the veterinarian and the fur-farmer, and American veterinarians will approve Freund's statement, concurring with those of other writers, that the veterinarian, and not the fur-farmer, should undertake the business of diagnosing and treating the diseases of these fur-bearers. However, if veterinarians are to diagnose and treat disease in these animals they must know the animals in health and in sickness. Freund has summarized the scattered literature of diseases of these animals for the first time, and is to be congratulated on his book.

A preliminary section of the book deals with the general appearance of the animals, the taking of food, the character of feces, diagnosis, and similar things. Another such general section deals with general therapy, including modes of administering drugs.

The next section deals with parasites and covers 130 pages. A general section deals with the effects of parasitism, methods of infection, prophylaxis, and the subjects of fecal examination and

treatment for parasitisms. There follow sections on Protozoa, trematodes, cestodes, nematodes, arachnids and insects. The parasites are briefly described and are figured in many cases, the treatment of the subject being adequate at this time for a book of this sort which does not undertake to supply a technical monograph on the morphology of parasites of fur-bearers. Life histories and distribution are briefly discussed. When treatments are known they are given, and such prophylactic measures as are recommended or used are covered. The subject matter is handled judiciously, and in the light of our imperfect knowledge the treatment is as well balanced as could be asked.

A section on bacterial infections covers 7 pages, the brevity of the treatment corresponding with the fact that such diseases, including tuberculosis, septicemia, paratyphus, colibacillosis, glanders and anthrax, are more or less rare in our fur-bearers, as far as we know at present. A section on virus diseases covers 7 pages, dealing mostly with distemper and encephalitis as of major importance, with incidental mention of rabies as a rarity. Spirochetoses receive brief mention and discussion.

Diseases of the various organs are treated of in 37 pages, this section covering skin diseases, digestive troubles, poisoning, pneumonia, obstetrical conditions, etc. Another section of 10 pages deals with such subjects as wounds, fractures, hemorrhage, etc.

A final section deals with necropsy statistics and parasite statistics, the latter including percentages of infestation at various times and places and a list of parasites known from each of the hosts covered. These hosts include foxes, skunks, martins, mink, weasel, raccoon, coypu, muskrat, beaver and opossum.

The book is provided with general and specific bibliographies, and it is of interest to note that of 364 such citations, 159 are those of papers by American veterinarians, zoologists and fur-farmers in the United States and Canada. From that list it appears that not less than 35 American veterinarians have concerned themselves, one way or another, with the diseases of fur-bearing animals. This group and those who have worked on diseases of wild animals other than fur-bearers form a fair veterinary nucleus for the future consideration of the larger problem of diseases of wild animals.

M. C. H.

EFFECT OF REPEATED AND CONTINUOUS PEPTONE INJECTIONS AND INGESTION IN DOGS. W. F. Peterson, E. F. Müller and C. Saelhoff. Jour. Immunol., xix (1930), 2, p. 165.

The period of maximum change in the reaction appears during the first ten days. This corresponds to the normal period of specific sensitization. Jobling and Peterson found that the serum of guinea pigs shows a gradual increase in the mobilization of proteolytic enzymes after the first sensitizing injection, reaching a maximum in ten days. This period also corresponds to the period of maximum change in the local response to chemical irritation. The character of the leucocytic response probably reflects changes in the autonomic status of the animal but the authors conclude that the time interval of 10-14 days which is so apparent in the sensitization phenomena has wider basis and must involve fundamental cellular changes which become manifest in both local and general reactions to other than specific protein agents.

TRANSMISSION OF MATERNAL IMMUNITY. J. H. Mason, T. Dalling and W. S. Gordon. Jour. Path. & Bact., xxxiii (1930), 3, p. 783.

Ewes immune against lamb dysentery do not transmit antitoxin to the lamb through the placenta. At parturition the antitoxic titre of the colostrum of immune ewes is greater than that of the serum. Antitoxin in the colostrum is absorbed by a newly born lamb but not by a four-day-old lamb. The first colostrum contains more antitoxin per volume than at any later time; the first suck by a lamb is important in the transmission of antitoxin. In the cow placental transmission of antitoxin, produced actively or passively, does not take place. The calf obtains its antitoxin from colostrum. Horse and sheep antitoxins are absorbed by a 12-hour-old calf and the excretion of the less nearly related horse antitoxin takes place more rapidly than that of the sheep.

Placental transmission of antitoxin was not detected in the mare. The intestine of a newly born foal allows the passage of the antitoxin contained in homologous and heterologous sera. Heterologous antitoxin fed to a lamb or contained in the mother colostrum is absorbed by the newly born animal. The administration of either homologous or heterologous "L. D." antitoxin to pregnant ewes a short time prior to lambing confers a definite protection to their lambs against naturally occurring lamb dysentery. Heterologous antitoxin injected into a pregnant bitch passes into the colostrum. Heterologous antitoxin in the colostrum is absorbed by the newly born pup.

THE EFFECT OF CERTAIN TOXIC SUBSTANCES IN BACTERIAL CULTURES ON THE MOVEMENT OF THE INTESTINES. IV. The Production and Action of the Toxic Substance of *B. dysenteriae* (Shiga Kruse). E. E. Ecker and B. J. Walpaw. Arch. Path., x (1930), 3, p. 407.

Although toxic manifestations were noted in rabbits that received filtrates of 24- to 40-hour-old cultures by vein, the most marked reactions occurred in those animals that received filtrates of 72- to 124-hour cultures. Diarrhea was more common. Of 38 animals into which the filtrates of various strains of the organism were injected, 28 died, 32 showed involvement of the central nervous system (medulla and cord) and 29 showed diarrhea of varying degrees of severity. The authors doubt that divisions into distinct fractions can be accomplished, in view of the complexity of the mediums employed for the production of these substances. The laparotomized animals showed an increase of contractions in the longitudinal muscles of the upper colon with marked propulsion. The authors assume that the filtrates, owing to their variable neurotoxic qualities, affect the vagus in a greater or less degree, or that the preëxisting tone of the intestines accounts for the reactions seen.

CORYNEBACTERIUM PYOGENES AS THE CAUSE OF POLYPOID LESIONS IN THE RETICULUM OF AN OX. G. O. Davies. Jour. Comp. Path. & Therap., xliii (1930), 2, p. 147.

Corynebacterium pyogenes was isolated in pure culture from a granulomatous lesion in the reticulum of an ox. The lesion was the size of a billiard-ball, with no apparent evidence of being the result of any injury to the reticulum. The colonies present in

the lesion were distinguishable microscopically from the colonies associated with actinomycosis.

Amyloidosis of Kidney in Cattle. T. Primgaard. Abst. Arch. Path., x (1930), 3, p. 469.

The so-called parenchymatous chronic nephritis in cattle is primarily an amyloidosis of the kidney complicated by interstitial and parenchymatous inflammation. In a few instances amyloidosis could be produced in mice and rats by injection with bacteria cultured from the cattle, but only one animal showed amyloidosis of the kidney.

Pulmonary Tuberculosis in Students. Lee H. Ferguson. Amer. Jour. Pub. Health, xx (1930), 9, p. 955.

Pulmonary tuberculosis in students, according to the author, is still a serious unsolved problem. It is usually of the adult type, insidious in onset and difficult to detect except by X-ray when there are no symptoms. The incidence of pulmonary tuberculosis in students is difficult to determine, probably between 2 and 3 per cent. Special factors in student life which may favor the development of tuberculosis are change of climate, too strenuous and poorly organized social life, outside work, poor health habits and the neglect of upper respiratory infections. The author suggests a careful adjustment of the entire habit life of students and recommends that the physical education programs should continue in the entire undergraduate and professional school courses.

Does the Nickel Dissolved from the Container During Pasteurization Catalyze the Destruction of the Vitamins of Milk? Avery D. Pratt. Jour. Nutri., iii (1930), 2, p. 141.

The nickel content of milk pasteurized in a nickel container was 16 parts of nickel per million parts of milk, while the same milk pasteurized in a glass vessel contained no nickel. There was no appreciable destruction of vitamin A by pasteurization in either a glass or a nickel container. The anti-neuritic factor of vitamin B complex was partially destroyed by pasteurization but there was no evidence of a catalysis of the destruction by nickel. Vitamin C was partially destroyed by pasteurization but nickel did not seem to increase its destruction. In testing the catalytic destruction by nickel of each of the vitamins A, B and C, three

groups of animals were fed a ration otherwise adequate and supplemented by raw milk, milk pasteurized in glass and milk pasteurized in nickel, respectively, to supply the vitamin in question. The author concludes that under the experimental conditions presented, the study of the rate of development of deficiency diseases, acuteness of symptoms, autopsy findings and growth curves, does not indicate that nickel dissolved from the container during pasteurization catalyzes the destruction of vitamins A, B, or C during the pasteurization process.

Immunological Studies with Tapeworm Antigens. Denis R. A. Wharton. Amer. Jour. Hyg., xii (1930), 5, p. 511.

Lipoids of the tapeworm *Moniezia expansa* obtained by extraction with alcohol and ether are incapable of sensitizing guinea pigs. The injection of lipoids or whole-worm extract into guinea pigs previously treated with lipoids does not result in anaphylaxis. The injection of a mixture of tapeworm lipoids and hog serum has no greater effect on guinea pigs sensitized with hog serum than has hog serum alone. The injection of a mixture of fresh guinea pig serum, lipoid and hog serum into guinea pigs sensitized with lipoid and horse serum does not cause anaphylactic shock. The addition of inactivated guinea pig serum to the lipoid before adding the hog serum has not the property of enhancing the effect. Control animals showed no signs of shock when injected with the mixture containing fresh guinea pig serum. The author concludes that the mixture is not anaphylatoxic and that tapeworm lipoids are not true antigens, but under certain conditions can influence the antigenic characters of proteins.

A Chemical View of the Pathogenesis of Tuberculosis. Esmond R. Long. Amer. Rev. Tuber., xxii (1930), 5, p. 467.

The first element to be considered in the pathogenesis of tuberculosis is the capacity of the bacillus to multiply in the physical and chemical environment of the tissues of the host. The growth requirements of the tubercle bacillus are well known in artificial culture. Its water relations, respiration and dependence on glycerol are distinctive. Animal tissues are well adapted to meet these requirements. The reaction and carbon dioxid production of tissues may reach an inhibiting degree. The availability of free glycerol may be a factor. Modifying the glycerol content of tissues artificially showed a profound effect

on growth in experimental tuberculosis. Tissue culture experiments and examination of infected organs showed the growth in the animal body to be usually intracellular. Observation of the initial cellular response to the introduction of tubercle bacilli in animals of varying susceptibility indicates that intense initial cellular response does not tend to check subsequent progression of the disease.

Native immunity in man or animal appears to depend on the capacity of tubercle bacilli to multiply in the cells of the host affected. Acquired immunity probably depends on a similar factor. Failure of growth in an immunized host would be quite as effective a factor in the failure of the development of tuberculosis as lysis of the germ. Acquired immunity is usually associated with hypersensitiveness. The manifestations of hypersensitiveness are a response to the protein of the tubercle bacillus. The necrosis of the tubercle and the acute cellular responses of tuberculosis are largely tubercle bacillus protein effects. The lipoids are responsible for much of the cellular response of the disease in its initial and chronic manifestations. Although it has not been proved, there is some reason for believing that the epithelioid cells of a tubercle, brought there through an allergic response, and increased in their hypersensitiveness by intimate contact with the developing microörganism, may become increasingly incompatible chemically for the life of the bacillus within their protoplasm.

MILK-BORNE DISEASE in MASSACHUSETTS, 1927-1929. George H. Bigelow and Filip C. Forsbech. Amer. Jour. Pub. Health, xx (1930), 10, p. 1094.

The report is based upon data from 95 of the 125 communities over 5,000 population and covers 3,604,314 persons, or 83 per cent of the entire population of the State. The proportion of all typhoid fever traced to milk has been increasing markedly, while for scarlet fever it has been decreasing. Over a period of 34 years, the four diseases considered range themselves by outbreaks in the following order of magnitude: typhoid fever, scarlet fever, septic sore throat and diphtheria; but by total cases in the following order of magnitude: septic sore throat, typhoid fever, scarlet fever and diphtheria. The rate of decrease of total cases spread by milk is greater then the decrease of outbreaks so spread. This suggests that fewer persons are exposed

to each outbreak and evidence shows that the smaller dealers less frequently protect their milk by pasteurization.

The year 1929 was the first since the first outbreak of milk-borne typhoid fever that has not witnessed an outbreak of this disease. There has been no outbreak of diphtheria for four years. Although the data are open to question, there is no evidence of an increasing consumption of milk over a ten-year period, in spite of the intensive health and commercial propaganda on this subject. An increasingly large proportion of milk is being pasteurized and there is an apparent increase in the number of communities annually adopting regulations requiring that all milk be either pasteurized or from tuberculosis-free cattle. However, 147 communities have no milk inspection and 30 per cent of the people live in cities and towns which allow raw milk from tuberculous cattle to be sold.

Glanders of the Lungs Simulating Pulmonary Tuberculosis. E. H. A. Pask. Abst. Arch. Path., x (1930), 4, p. 622.

Glanders of the lungs is a rare disease and is usually acute and rapidly fatal, being part of a general septicemia. The case reported was of a more chronic type, closely simulating pulmonary tuberculosis, with death six months after the onset of the symptoms in the chest. The patient was a man, aged 35. The sputum was negative for the tubercle bacillus, but glanders developed in injected guinea pigs.

A Comparison of the Intracerebral Method with Other Methods of Inoculating Guinea Pigs for the Diagnosis of Tuberculosis. Thomas B. Magath and William H. Feldman. Amer. Rev. Tuber., xxii (1930), 5, p. 514.

An experimental study was made in an attempt to evaluate the reliability of the method of intracerebral injection in determining positive tuberculosis infection from clinical material which was negative to careful microscopic examinations. The material consisted of 211 specimens, representing 153 persons. For the purpose of comparison, use was made of the results obtained in the guinea pigs that had been given routine subcutaneous and intraperitoneal injection with portions of the same material. Nearly three times as many positive results were revealed by the routine method as by the intracerebral method.

The difference was probably not due to the intracerebral exposure being a less sensitive one. It could perhaps be accounted for by the difference in the amount of infective material possible to inject in the two groups of animals. Also, the results could have been due to the large number of animals given intracerebral injection which died before a demonstrable tuberculosis infection had had time to develop. This factor constitutes the most serious objection to the use of the intracerebral method for determining tuberculous infections of clinical origin. The authors conclude that the method might be used as an auxiliary procedure in selected cases but it cannot be offered as a method of preference in the diagnosis of tuberculosis by inoculation of animals. It has, however, unquestionable merit as a means of inducing the disease in certain studies on experimental tuberculosis.

Undulant Fever. E. C. Bayley. Minn. Med., xiii (1930), 10, p. 713.

Bacterium melitensis will produce abortion in cattle and undulant fever in man, the exact mode of transmission not being known. Undulant fever should be suspected in any patient with an unexplained fever. The author states that the number of cases is increasing and that the greatest point in treatment is prophylaxis. All animals harboring the disease should be destroyed, barns and buildings that house them should be cleansed and disinfected and well aired, and milk should be boiled or pasteurized. A case is reported of an individual contracting undulant fever after partaking of cream and strawberries. The herd furnishing the family with milk was tested and ten of the herd were infected with *B. abortus*.

Coccidiosis in Gallinaceous Birds. Ernest Edward Tyzzer. Amer. Jour. Hyg., x (1929), 2.

The seemingly inconsistent results obtained by those who, during the past, have studied the pathogenicity and behavior of the co-called *Eimeria avium* in chickens are better understood as a result of this research. In the chicken four distinct species of coccidia and their pathogenic properties are described.

I. *Eimeria tenella* (Railliet and Lucet, 1891) designates the species producing severe hemorrhages in the ceca and sometimes in the large intestine and lower small intestine. The oöcysts of this species are ovoid, 19.6μ to 26.1μ long and 16.3μ to 22.8μ wide, sporulating in 45 to 48 hours at room temperature. Ex-

perimentally infected birds become less active, show anorexia and remain close to the hover on the fourth day. On the fifth day large quantities of bright red blood are passed. Oöcysts appear in the feces seven days after ingestion of infective forms. Most of the deaths occurred from five to seven days after infection. Those surviving for more than seven days usually recovered with proper care. *E. tenella* is found in the epithelial cells lining the intestine and in distended epithelial cells that have migrated into the interglandular tissue of the ceca and lower intestine, resulting in extensive tissue destruction and hemorrhage. In the more serious cases, *Salmonella pullorum* infection also was noted. Birds that are sacrificed seven or eight days after infection will show a cecal wall which appears whitish or milky, produced by the accumulation of oöcysts in the glands. If tissue destruction has not advanced too far, the cecal mucosa may regenerate sufficiently for the return of function. In some instances granulation or connective tissue proliferation may produce constrictions, resulting in obstruction and retention of cecal contents. If birds are exposed to further infection and improperly cared for, they may become emaciated and unable to stand. The mortality in a severe *E. tenella* infection (hemorrhagic cecal form), in 84 chickens in which the infection ran its natural course, was as follows:

Died at 5 days	14
Died at 6 days	48
Died at 7 days	5
Died at 13 days	1
Died at 17 days	2
Recovered	14
Total	84

II. *Eimeria mitis* (new species) designates a form which is distributed in a diffuse manner chiefly in the upper portion of the small intestine. The oöcysts are smaller than those of *E. tenella* and almost spherical, being 14.3μ to 19.6μ long and 13.0μ to 17.0μ wide. Sporulation takes place in 40 to 48 hours at room temperature. It penetrates into the epithelium, frequently beneath the nucleus. Invaded epithelial cells desquamate and regeneration takes place promptly because only individual cells are involved instead of large areas of tissues, as in the *E. tenella* infection. The *E. mitis* appears to be relatively harmless, since it does not seem to affect the condition of the bird and no gross

lesions are found at autopsy. Oöcysts appear in the dejecta five days after infection.

III. *Eimeria acervulina* (new species) is found chiefly in the upper half of the small intestine, sometimes in the lower portion and rarely in the ceca near the outlet. Oöcysts are egg-shaped, 17.7μ to 20.2μ long and 13.7μ to 16.3μ broad. Sporulation takes place within 24 hours or less at room temperature. Invasion by *E. acervulina* occurs in foci, the maturing oöcysts accumulating at these points, which results in the formation of chalk-like, whitish or gray areas on the intestinal mucosa. In heavy infections these lesions may become confluent. This species invades only the upper portion of the epithelium, sometimes from two to four organisms being found within a single cell. Oöcysts appear in the droppings four days after infection. The droppings assume a greater chalk-like appearance than normal and growth seems slightly retarded in experimental infections. In an outbreak of natural infection with *E. acervulina* the birds were extremely emaciated and the foci of involvement were so numerous that the entire mucosa appeared gray, resulting in digestive disturbances.

IV. *Eimeria maxima* (new species) a coccidium having egg-shaped oöcysts, one end being rather pointed, 21.4μ to 42.5μ in length by 16.5μ to 29.8μ in width, sporulating in 48 hours at room temperature, involving the middle portion of the small intestine. The wall appears swollen and blood-vessels in the villi are thrombosed. Blood is present in the lumen in flecks or shreds and the exudate is stained pink. In some cases the unopened intestine may present areas of opacity visible through the serosa. The birds show anorexia, paleness, roughened feathers and appear droopy. The droppings show an excessive chalk-like material and the exudate is tinged with blood. When *E. maxima* is present, together with the *E. acervulina*, the infection may continue over a longer period of time. These two forms are present in the so-called "chronic coccidiosis," characterized by a thickened small intestine and a hemorrhagic exudate.

Cryptosporidium was present in some birds, but was regarded as a probable infection with *C. parvum* of the common mouse.

The coccidia of pheasants, turkeys and quail were studied and several new species are described. No cross infections were obtained in chickens, pheasants, turkeys and quail with *E. acervulina*, *E. phasiani* and *E. meleagridis*.

The probability of infection under natural conditions other than by the sporozoites of sporulated oöcysts seems slight. The introduction of large numbers of merozoites into the lower intestinal tract did not produce infection. Birds that have passed through the acute stage or those with light or unrecognized infections passing oöcysts are looked upon as the general source of infection. Infection by various unnatural routes was attempted with inconclusive results. The ingestion of sporulated oöcysts is considered the usual mode of infection.

Coccidiosis is a self-limiting disease. Coccidial infections die out promptly when the ingestion of sporulated oöcysts is prevented. *E. maxima* infections may disappear completely within 10 days, but *E. tenella* may require a longer period, because of the delayed eliminations of oöcysts which are situated in the deeper portions of the mucosal tissue. *E. mitis* infection may terminate in about 11 days. A duration of 13 days was recorded in a mixed infection of *E. acervulina*, *E. mitis* and *E. maxima*.

A strict immunity results from infection in some cases, while in others an incomplete but effective protective reaction is produced. Continued infection with a given species may incite a substantial immunity, resulting in a disappearance of the infection. When a single feeding of oöcysts is given, the infection generally eliminates itself before the host becomes immune, and with some species it is possible to reinfect the birds repeatedly by single administrations of sporulated oöcysts. Immunity is developed slowly with the species (*E. mitis* and *E. acervulina*) that develop superficially in the intestinal epithelium. The most pronounced immunity is developed by infections with the species *E. tenella* and *E. maxima*, which penetrate deeply and involve definite areas or foci. A resistance to one species of coccidium in no case was found to protect against any other species. Subcutaneous or intraperitoneal inoculations of the serum of *E. tenella*-immune birds furnished no protection against the ingestion of sporulated oöcysts of this species.

Rations high in milk content or milk sugar were not found efficacious in preventing infection. It is pointed out that the greatest development of coccidia takes place in those portions of the chicken's intestine which have the most acid reaction, *i. e.*, duodenum and ceca. The clinical picture of avian coccidiosis may be altered depending upon the coccidial species involved and their numerical predomination.

H. E. B.

Iowa Raises Entrance Requirements

According to an announcement made recently by Dean Stange, beginning with the year 1931-32, applicants for admission to the College of Veterinary Medicine, Iowa State College, must present a total of not less than one year (45 quarter or 30 semester credits) of work in an approved college or university. These college credits must include English, chemistry, biological sciences and electives. It is recommended that the elective subjects, totalling 10 semester hours, be selected from physics, mathematics, German and French.

In commenting upon this change, Dean Stange hopes that the one year of pre-veterinary work will be increased to two years of similar work within a short time. The lengthened veterinary course at Iowa State College has been spoken of as a five-year course, but it should not be regarded as such because the student may take his preparatory work at a good junior college, near his home, or may transfer to veterinary medicine after having taken one or more years of another course.

By shifting certain courses in arts and science courses, into the pre-veterinary year, it will be possible to offer additional work which heretofore was impossible because of the crowded condition of the veterinary curriculum. It also makes it possible to offer the senior student some choice of subjects, in which he is especially interested, during his senior year.

The entire staff organization in the College of Veterinary Medicine has been rearranged and two additional departments will be recognized. These are the departments of Hygiene or Preventive Medicine, and Obstetrics and Genital Diseases. The departments of Anatomy, Physiology, Pathology, Medicine and Surgery will remain. The College of Veterinary Medicine therefore will be made up of seven departments, in addition to the research investigations being conducted at the institution. Arrangements will be made whereby it will be possible for the

senior veterinary student to take elective work in any of these departments, or he may elect work outside of the College, if he should be interested in some particular subject such as genetics, nutrition, and so forth.

Close Control of Digitalis Continued

Continued close regulatory control of imported digitalis, as well as the drug in the crude and tincture form as it enters the channels of trade in this country, is included in plans for 1931 of the drug-control office of the Food and Drug Administration, U. S. Department of Agriculture, according to an announcement by Dr. J. J. Durrett, chief of drug control. "From July 1, 1927, to June 30, 1930," says Doctor Durrett, "federal officials examined 151 samples of crude digitalis. Of these, only 2 assayed less than 100 per cent by U. S. Pharmacopoeia definition. In this period, the Department of Agriculture instituted legal proceedings against several manufacturers of digitalis preparations in cases where the preparation did not meet the standards prescribed by the law."

The Administration also plans extensive research into the nature and pharmacological properties of both digitalis tincture and the crude drug. "We are aware," says Doctor Durrett, "that there is some deterioration of digitalis tincture after it enters commerce and we are going to try to find the reasons. Preliminary research has convinced us that digitalis preparations are liable to deterioration on the shelves of drug stores or warehouses to some such degree as the Administration's investigations proved fluid extract of ergot to be. The ergot studies showed that deterioration set in not long after manufacture and continued for a period, after which the ergot extract no longer had therapeutic value. Upon the strength of this ergot study, the Administration recommended to the U. S. Pharmacopoeial Revision Committee that ergot extracts be put up in smaller packages, on which the date of manufacture was to be printed, and that the fluid extract be taken from the market as soon as it loses its medicinal value. Many distributors of fluid extract of ergot have adopted this recommendation and are packaging their product in compliance with it. The administration will try to work out methods of insuring the sale only of a tincture of digitalis which has not deteriorated while on the shelves of retail pharmacies."

This work, as well as other activities planned for 1931, is possible because a $75,000 increase in congressional appropriations for enforcement of the food and drugs law, enables the Administration to enlarge its staff of scientists engaged in drug-control work. Other plans for the year include continuation of work on alleged antiseptics and so-called remedies for malaria, influenza and other diseases. Increases in the staff dealing with veterinary drug products and in the force of medical men in the drug-control office are also in prospect. Doctor Durrett says that in 1931 his office proposes to cover more thoroughly investigations on which considerable work has been done in the past.

New Record in Testing for Tuberculosis

A new high record in the tuberculin-testing of cattle is revealed in a report recently made public by the U. S. Department of Agriculture, which shows that in October, 1,320,885 cattle were tested by federal, state and county veterinarians working cooperatively. In October, 3,416 more cattle were tested than in May, 1930, when the testing reached its previous high total in the cooperative campaign to eradicate tuberculosis. It is noteworthy that the reactors in October were 3,709 fewer than the reactors removed in May.

The high record for October was the result largely of active work in the states of Wisconsin, Iowa, Illinois, Minnesota and New York, in each of which more than 100,000 cattle were tested. The highest number of tests (158,132) was made in Wisconsin. In Iowa and Illinois there were 133,883 and 133,645, respectively. Slightly more than 1.14 per cent of the total cattle tested in all states during October were classed as reactors, signifying infection with tuberculosis.

Three states—North Carolina, Maine and Michigan—have completed the tuberculin-testing of all cattle, and the extent of the disease in these states is now materially less than ½ of 1 per cent of the cattle remaining. A total of 1073 counties, or more than one-third of the counties in the country, have virtually eradicated bovine tuberculosis. Approximately 400 additional counties are actively engaged in eradication of the disease.

A new statistical summary of the tuberculosis eradication work with respect to cattle, swine and poultry recently was issued by the Department.

ARMY VETERINARY SERVICE

Regular Army

No changes.

Colonel Robert Vans Agnew, U. S. Army, retired, died as the result of an automobile accident near Jonesboro, Ga., November 13, 1930. (Obituary, p. 136.)

Veterinary Reserve Corps

New Acceptances

Lombard, Charles Morris	1st Lt.	7825 Emerald Ave., Chicago, Ill.
German, Walter Allen	2nd Lt.	6545 So. Union Ave., Chicago, Ill.
Vansant, Allen Stearne	2nd Lt.	920 Huntington Pike, Fox Chase, Phila., Pa.

Promotions

	To	
Turner, John Pollard	Colonel	1357 Kennedy St., N. W., Wash., D. C.
Beckham, Louis Edgar	Lt. Col.	2304 14th St., Tuscaloosa, Ala.
Davisson, Lee	Major	R.F.D. No. 2, Manchester, Mich.
Hannon, Eugene Leo	Major	248 S. Appleton Ave., Pittsfield, Mass.
Lowenberg, Robert Irving	Capt.	918 15th Ave., S., St. Paul, Minn.
Miller, Edward Valentine	Capt.	Box 555, Mountain View, Mo.
Stout, Harry Philip	Capt.	6754 Normal Ave., Apt. E1, Chicago, Ill.
Shaffer, Xenophon Bryan	1st Lt.	702 S. Richardson Ave., Vicksburg, Mich.

GROUP OF B. A. I. VETERINARIANS

This photograph was taken during the clinic at the Detroit convention, 1929. How many of the group can you recognize?

COMMUNICATION

QUALITY RATHER THAN QUANTITY

To the Editor:

The November, 1930, issue of the Journal carries an editorial stressing the need of graduating many more veterinarians in the near future, to maintain the numerical strength of the profession. On the other hand, a praiseworthy communication in the September, 1930 issue of the Journal stresses the need of a five- or six-year course.

It is interesting to learn authoritatively that starting in October, 1932, the present two-year course in podiatry (chiropody) is to be lengthened to a three-year course, after a high school education; and further, beginning in October, 1934, it is contemplated to add one year of collegiate work to the academic requirements for students seeking admission to the First Institute of Podiatry (Chiropody) in New York City. That institution has now a full list for the year 1930-1931 and 42 are being carried over for the 1931-32 group, limited to 65 students.

It seems to me that the veterinary profession is lagging far behind others in the matter of seeking quality and not quantity graduates. Too many men are now being graduated who, immediately upon graduation, set themselves up in offices, stores, stables and barns as specialists in small-animal work, etc. It is obvious that one so limited in training and experience is not fully qualified to render public service as a specialist; and further, many so-called small-animal hospitals are maintained and managed in such a manner as to prove more detrimental than beneficial to the profession.

Just recently I asked an outstanding member of our profession why European veterinarians were considered so highly by the public in their respective communities and countries, and what must we in the United States do to attain that standing. The answer was that the veterinary profession in this country must raise its standard to attract a better type of student, raise the courses in the veterinary colleges to give a more thorough training, and send forth graduate veterinarians who are, in every sense of the word, thoroughly qualified and trained to meet and discuss with our legislative bodies the value of the work of the veterinary profession and its relation to public health.

And that not from the standpoint of the individual dog or cat, but from the angle of the value of anti-rabic inoculation on a large and complete scale; not from the standpoint of the treatment of the individual hog, but from the angle of proficient and well qualified men doing wholesale hog cholera vaccination; not from the standpoint of treating the average dairy cow, but from the angle of efficient and well conducted tuberculin-testing in every area of the country.

Further, the only way to combat farm agents, quack remedy manufacturers, radio broadcasters who style themselves "the farmers' friend and advisor" and many other illegitimate inroads to a really worthwhile profession is to raise the standards of admission to our veterinary colleges, and they in turn raise their courses to five and six years, so that each student may receive a more thorough and most complete training, thus putting the future veterinarian on a much higher plane in the public eye.

As you realize, the profession is already well crowded with too many practitioners who tend towards complete commercialism. Let us try to keep our small-animal hospitals really and truly hospitals and not places where one may purchase collars, leashes, worm pills, dog feeds, etc. 'Tis true that that is a source of revenue with many and they feel justified in carrying the "side lines" to combat patent remedy and dog feed manufacturers, but, personally, I feel that if we educate the public to know what they may and may not expect on entering a small-animal hospital, we shall all derive more professionally from our labors.

While self-praise is no recommendation, nevertheless let us come forth with an increased and more intensive course of study for the better type of student in our veterinary colleges and then we can honestly tell the public that we, as a profession, are qualified to give honest efficient *service;* the best that may be obtained for the betterment of their public health interests, be it their dairy business, their poultry or hog raising, or the care of the household and family through the care of their home and farm animals.

I hope that the Editor will find space in an early issue to publish this communication. Meanwhile, let us plan to make the coming year, 1931, a year in which to achieve a better and longer course in our veterinary colleges, fewer but better graduates, and above all the elevation and recognition, by the public generally, of a truly worthwhile and wonderful calling—the veterinary profession.

REUBEN GORDON.

Patchogue, N. Y., November 24, 1930.

AMERICAN VETERINARY MEDICAL ASSOCIATION

Report of the A. V. M. A. Representative to the Fourth World's Poultry Congress

MR. PRESIDENT AND MEMBERS:

The gathering together of persons interested in all phases of the poultry industry has been a notable achievement of the organizers of these congresses. The fourth World's Poultry Congress was organized by the Ministry of Agriculture and Fisheries in conjunction with the Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland. The sessions were held in Crystal Palace, a well chosen building, in London, during July, 1930. Nine days were given over to the activities of the Congress. Sixty-one countries were represented and the congress had 2,300 members. A total of 80,000 people visited the Congress exhibition.

The sessions of the Congress were divided into six sections, with a total of 151 papers. The sections consisted of (1) Breeding and Incubation, (2) Nutrition and Rearing, (3) Diseases and Their Control, (4) Economics (including marketing), (5) Education and General and (6) Rabbits.

The official languages of the conference were French, German, English, Spanish and Italian. Interpreters were present at all sessions and abstracts of the papers together with the discussions were accurately and rapidly translated into the other official languages not used by the speaker. The ease with which this was done made one feel entirely at home. Copies of all papers printed in English and summarized in French, German, Spanish and Italian were furnished to members of the Congress so that one entered the session fully prepared.

The live stock display consisted of 7,000 head of the world's best stock in fowls, ducks, geese, turkeys, pigeons and rabbits. Practically every poultry breed of importance was represented——spotted geese, Roman geese, turkeys, runner ducks from Italy, white-legged, bare-necked and crested fowls from Central Europe, old English game birds and a variety of others. The modern breeds, as would be expected, received a considerable portion of the attention.

I shall not attempt to discuss fully the material presented, as a final report of the proceedings will soon be available. A copy

of this report may be obtained by writing to Prof. G. F. Heuser, Poultry Department, Cornell University, Ithaca, N. Y. The cost of this report has not been decided upon as yet but it will be approximately $2.50. Individuals interested in obtaining copies of all papers presented at the various sessions should write to the Ministry of Agriculture, Whithall, London, England.

Brief mention, however, of a few of the outstanding papers in the Section on Diseases and Their Control may be justified. The German investigators considered fowl typhoid and pullorum disease the same, differing only in manifestations. The relationship of *Salmonella sanguinaria* and *Salmonella pullora* is so close that they see no reason for differentiation. This view was not accepted by all present.

The use of fully living fowl-pox virus for pullet inoculation was condemned by the German and English workers. They believed that its use was not justified, as the danger to inoculated flocks was too great, as is also the danger of soil contamination. Dr. Doyle, of the Ministry of Agriculture Laboratory at Weybridge, England, spoke very highly of the use of pigeon-pox virus for immunizing pullets. The mild "takes" produced and the lack of any general disturbance in the inoculated birds seemed to be points in favor of this virus. Field tests have shown it to produce sufficient immunity for natural protection against fowl-pox.

Dr. Zwick, of the Giessen Veterinary School, held the same view as Dr. Doyle. Zwick states that the fowl-pox virus modified by passage through pigeons, the pigeon-pox virus, the mixed virus (Zwick, Seifried and Schaaf) and the virus of Bierbaum, Eberbeck and Rosch all deserve a greater confidence. The mixed virus referred to above is a double virus prepared by cultivating cow-pox and fowl-pox virus on mammals, particularly calves. The virus of Bierbaum, Eberbeck and Rosch is the combination fowl- and pigeon-pox virus.

It can be predicted that the interest stimulated by the work of these European investigators will result in similar experiments in this country.

Prof. J. E. Ackert, of the Kansas State Agriculture College, presented some important data on development in the importance and control of the intestinal roundworm *Ascaridia lineata* of chickens. The laboratory experiments conducted showed that when White Leghorn chickens are reared free from worms for three months, they are so resistant to the growth and development of the larvae of *A. lineata* that the chickens are unlikely

to be harmed even by swallowing large numbers of infective *A. lineata* eggs. The lack of vitamins A and B in the diet was found to lower this same resistance.

Dr. E. B. Cram, of the U. S. Bureau of Animal Industry, contributed some important and highly interesting information on the life cycles of some roundworms in poultry and game birds. *Tetrameres americana, Cheilospirura hamulosa* and *C. spinosa* were found to spend their intermediate stage in the grasshoppers, *Melanoplus femurrubrum* and *M. differentialis. Dispharynx spiralis* was found to have its intermediate stage in the sow bug, *Porcellio scaber.* The species *Gongylonema* probably *G. ingluvicola* was determined to have an intermediate stage in dung beetles, *Copris minutis* and *Phoneaus vindex.*

The other papers were of a high caliber and a perusal of the report is necessary for a proper appreciation.

The Congress members were well entertained. Trips were made to nearby poultry plants and evenings were well spent with musicals and displays. The corporation of the City of London entertained the members at a conversazione which will be a pleasant memory to all who attended. The nine days of the Congress were well planned and well conducted, for which the organizing group deserves much credit. Everyone was impressed that Great Britain knew how to conduct such a huge affair and that she did it royally.

Respectfully submitted,

E. L. BRUNETT.

Resume of Minutes of Special Meeting of the Executive Board, Chicago, Ill., December 3, 1930.

A special meeting of the Executive Board of the American Veterinary Medical Association was held at the La Salle Hotel, Chicago, Ill., Wednesday evening, December 3, 1930, at 8:00 p. m. Dr. Robert S. MacKellar, Chairman, presided.

The roll-call showed the following in attendance: Dr. Robert S. MacKellar, Member-at-Large and Chairman; Dr. Geo. Hilton, Executive Board District 1; Dr. E. P. Althouse, Executive Board District 2; Dr. L. A. Merillat, Executive Board District 3; Dr. C. A. Cary, Executive Board District 4; Dr. C. P. Fitch, Executive Board District 5; Dr. C. H. Hays, Executive Board District 7; Dr. N. F. Williams, Executive Board District 8; Dr. D. H. Udall, Executive Board District 9; Dr. O. V. Brumley, Executive

Board District 10; President Maurice C. Hall, Ex-President, Dr. T. H. Ferguson and Secretary-Editor Hoskins. Absent: Dr. George H. Hart, Executive Board District 6.

The minutes of the meetings of the Executive Board held at Los Angeles were read and approved.

Dr. John R. Mohler appeared before the Board, accompanied by Dr. Adolph Eichhorn, to discuss preliminary plans for the 1934 International Veterinary Congress. The Board endorsed the action of Dr. Mohler in extending the invitation on behalf of the American Veterinary Medical Association for the International Veterinary Congress to meet in the United States in 1934. The President was authorized to appoint a special committee for making the necessary arrangements in connection with the Twelfth International Veterinary Congress.

Dr. A. T. Kinsley appeared before the Board on hehalf of the Local Committee on Arrangements for the Kansas City meeting, Dr. Kinsley being chairman of the Committee. The Board designated August 25-26-27-28 as the dates for the 1931 convention.

Dr. T. E. Munce, of Harrisburg, Pa., was present as chairman of the Special Committee on Affiliation of State, Territorial and Provincial Veterinary Associations with the A. V. M. A. Dr. Munce reported the progress that had been made by the Committee in studying the proposal for affiliation and presented an outline of the plans as far as these had been worked out. The Committee was authorized to submit a tentative outline of the plans to all state, provincial and territorial veterinary associations.

For the Special Committee on Permanent Home, Dr. L. A. Merillat, of Chicago, reported unfavorably on the proposal to acquire a site and erect a building in Chicago, at the present time. Considerable discussion followed as to what effect this would have on the original recommendation of the Executive Board, as approved by the Association at the Minneapolis meeting, as regards using rented quarters in Chicago. A final decision in the matter was deferred until an opportunity is presented to place the matter before the Association at the Kansas City meeting.

The Secretary reported several cases of reported violations of the Code of Ethics by members of the Association. After thoroughly discussing these cases, the Board instructed the Secretary to cite two members to appear before the Board at the meeting in Kansas City, to answer the charges preferred against them.

The Board approved a number of bills for which specific appropriations had not been made in the budget.

With reference to the proposed amendment providing for an increase in the annual dues, action on which was deferred at the Los Angeles convention, the Board decided to recommend to the Association that the dues be increased to $6.00 per year and the initiation fee increased to $6.00. This recommendation will go before the Association at Kansas City for approval or otherwise.

Treasurer Jacob was authorized to increase the amount of the bond insuring our deposits in the bank at Knoxville, Tenn. The amount was left to the discretion of Treasurer Jacob.

The Board authorized the appointment of a special committee to investigate a number of alleged violations of the Code of Ethics by members of the A. V. M. A. who were using the radio, as well as telephone directories, for advertising.

A communication from Dr. B. T. Simms, of Corvallis, Ore., addressed to the Board, was read, relative to the advisability of the A. V. M. A. providing awards of some kind for meritorious work in the field of veterinary medicine. The Board authorized the appointment of a special committee to study the proposal and report back to the Board.

The chairman of the Board and the secretary were authorized to select a design for a lapel emblem to be worn by junior members of the Association.

Dr. George Hilton, for the Special Committee on Certificates for Honorary Members, reported progress.

The meeting adjourned at 2:00 a. m.

H. PRESTON HOSKINS, *Secretary.*

Allied Laboratories Announce Changes

Allied Laboratories, Inc., recently announced the transfer of their Pitman-Moore anti-hog cholera serum and virus plant from Zionsville, Ind., to Sioux City, Iowa. The Pitman-Moore serum unit will continue under the direction of Dr. T. W. Munce, Director of the Pitman-Moore Biological Laboratories. He will have associated with him Dr. F. W. Larson, who was veterinarian-in-charge of the Sioux City plant for a number of years.

Facilities for the production of other Pitman-Moore biological products at Zionsville will be expanded with the transfer of the anti-hog cholera serum unit to Sioux City. The research work also will be enlarged at Zionsville. Dr. S. H. Regenos, chief bacteriologist of the Pitman-Moore Laboratories, will continue in charge of the production of biologicals at the Zionsville plant.

SOUTHEASTERN WISCONSIN VETERINARY ASSOCIATION

During the past summer the veterinarians of Dodge, Jefferson, Columbia and Washington counties organized what is known as the Southeastern Wisconsin Veterinary Association. The motto of the Association is to know your fellow practitioner better and promote veterinary work by passing on little hints which count in every-day practice.

The first officers were elected as follows: Dr. J. E. Hickey, Juneau, president; Dr. Edward Boesewetter, West Bend, vice-president; Dr. George A. Gettelman, Hartford, treasurer, and Dr. J. O. McCoy, Reeseville, secretary.

The Association had held meetings at Juneau, Columbus, West Bend and Watertown. Beginning with a paid-up membership, in August, of twelve members, the Association now has grown to twenty-seven members. The Association meets in the different counties as their turns come. The members in the county where the meeting is held prepare the program.

At the meeting in Juneau, Dr. J. O. McCoy read a paper on rabies, which was very well discussed. At West Bend, Dr. Edward Boesewetter read a paper on traumatic percarditis, which brought out a very good discussion, especially for the younger men, as they do not get a chance to hold many postmortems on these particular cases.

At Columbus, Dr. D. E. Bleecker read a paper on parturient paresis. This paper brought out a lively discussion relative to the merits of the oxygen treatment versus the calcium or glucose treatment. This interesting comparison of notes gave plenty of food for thought. Mr. Hobday, county agent for Columbia County, gave a brief talk on the relationship between the county agent and the veterinarian.

The final meeting for 1930 was held in Watertown and was in the form of a turkey banquet. Dr. B. B. Howell, of Jefferson,

donated the turkeys. Dr. W. W. Arzberger read a paper on torsion of the uterus which certainly brought out a good discussion as to the various ways to reduce the torsion. Dr. Boesewetter showed a home-made instrument which should be in every instrument catalog, and as far as I know I have never been able to find it. It is an iron rod, about three feet long, with two eyes on one end and an elongated eye on the other. Ropes are attached to the calf in the uterus and passed through the two eyes of the rod, after which the rod is placed in the uterus as close as possible to the calf. Then by placing a handle in the outside eye of the rod, it is rotated in such a direction as to reduce the torsion, after which it is a simple matter to deliver the calf.

J. O. McCoy, *Secretary.*

MICHIGAN DIVISION OF NATIONAL ASSOCIATION OF B. A. I. VETERINARIANS

On the evening of November 4, 1930, the Michigan Division of the National Association of B. A. I. Veterinarians had the privilege of listening to Dr. I. F. Huddleson, of the Department of Bacteriology and Hygiene, Michigan State College. The speaker was introduced by Dr. R. F. Vermilya, B. A. I. inspector-in-charge of the Detroit station.

Dr. Huddleson, who is a prominent figure in scientific circles, had selected for his topic, "Brucella Infections." To say that he lived up to his reputation in the matter of covering the subject would be putting it mildly, for he surely treated the topic, as well as handled the spirited discussions that followed, in a masterly fashion.

Several of those present subjected themselves to the rapid test for undulant fever, which was demonstrated by the speaker of the evening.

The attendance at this meeting seemed to run parallel to the interest displayed in the subject discussed, as quite a number of veterinarians located in Detroit, representing the various branches of the profession, were present.

Publicity Committee.

PURDUE UNIVERSITY VETERINARY SHORT COURSE

A short course for graduate veterinarians was held at Purdue University, LaFayette, Indiana, November 5, 6 and 7, 1930.

Wednesday afternoon, November 5, and the first period Thursday morning, November 6, were given over to a laboratory demonstration in the technic of the slow and rapid agglutination tests for Bang disease. This was followed by a discussion of methods of collecting blood samples and preparing them for shipment, by Drs. F. H. Brown and C. C. Dobson, of the Indiana State Live Stock Sanitary Board.

Prof. E. A. Gannon, dairy extension specialist, Purdue University, discussed dairy herd management. Prof. Gannon emphasized the importance of keeping production records of the individual animals in the herd, and practicing disease control measures.

A short address by Dean J. H. Skinner, in which he welcomed the veterinarians to Purdue University, and discussed the importance of veterinary service in a live stock community, closed the Thursday morning session.

It was believed advisable to hold a clinic Thursday and Friday afternoons, and the interest shown by the veterinarians justified us in giving so large a portion of the time to this work. However, it is only fair to give Dr. T. H. Ferguson, Lake Geneva, Wisconsin, credit for the success of the clinic.

The banquet was held in the Student Memorial Union Building, Thursday evening. The toastmaster, Dr. F. H. Brown, called on several of the veterinarians for short talks. Dean C. H. Stange, Ames, Iowa, was the principal speaker. He gave a very interesting and instructive address on "Veterinary Education in Europe."

A poultry clinic was held Friday morning, November 7. A number of birds were examined and autopsied. This was followed by an address on "Research Work in Veterinary Medicine" by Dean Stange. Several veterinarians complimented Dean Stange on his address. This experience has demonstrated to us that practicing veterinarians are interested in this phase of veterinary service.

Prof. F. G. King, Purdue University, discussed the management of a breeding herd. He gave statistics showing the narrow margin of profit in growing beef cattle, and the great necessity of economic methods of production. A large part of Prof. King's time was taken up with questions.

The interest on the part of the veterinarians who attended the 1930 Short Course was unusually good, and if we compare

the interest in this course with that of previous ones, we may conclude that the 1930 Short Course was the most successful of any that we have held.

R. A. CRAIG.

HUDSON VALLEY VETERINARY MEDICAL SOCIETY

The regular quarterly meeting of the Hudson Valley Veterinary Medical Society was held at Poughkeepsie, N. Y., on November 12, 1930. This being the annual meeting, when election of officers and other business of the Society must be transacted, no formal program was prepared.

After lunch at the Nelson House, President I. O. Denman called the meeting to order, and delivered his annual address, setting forth some of the activities of the Society during the past year and pointing out wherein the organization could in the future assist in up-building the profession. The Secretary reported on the condition of the Society, showing a membership of sixty-five, all veterinarians in eastern New York being sent regular notices of the meetings of the Society.

Election of officers followed. Dr. Adolph Eichhorn, of Pearl River, was elected president; Captain L. L. Shook, of the Veterinary Corps at West Point, Vice-President, and the Secretary-Treasurer was re-elected.

In the business session the Society acted favorably upon a resolution asking for an appropriation to the New York State Veterinary College, to provide a building with equipment and personnel for the study of poultry diseases and to assist poultry-owners in their problems. In the discussion concerning this resolution it was strongly emphasized by those speaking that this work should be in the hands of properly trained persons and that animal disease problems should be supervised by veterinarians and not by agricultural workers, farm bureau agents, etc. It was also made clear that members of the profession recognize the importance of the poultry industry and the necessity of giving attention to the diseases affecting it. The legislative committee of the Society was authorized to take any action that it might deem necessary in relation to proposed legislation with respect to appropriations for the study of poultry diseases.

The Society authorized the incoming president to continue the Committee on Publicity, which is cooperating with the Farm Forum of the WGY radio broadcasting station, in supervising

the answers to questions pertaining to veterinary medicine and allied subjects.

Following the business session, a considerable number of case reports were discussed by nearly all members present and the Society then adjourned, to meet in Albany, at the next quarterly meeting, on February 11, 1931.

J. G. WILLS, *Secretary-Treasurer.*

BAY COUNTIES VETERINARY MEDICAL ASSOCIATION

At the annual meeting and banquet of the Bay Counties Veterinary Medical Association, held Tuesday evening, November 13, 1930, at the Elk's Club, San Francisco, Calif., the following men were elected to office for the year 1930-1931: President, Dr. O. J. Kron, San Francisco; vice-president, Dr. J. B. Boomer, San Francisco; and secretary-treasurer, Dr. Geo. M. Simmons, San Francisco.

Dr. H. E. Torgerson, of San Francisco, spoke on "The Veterinary Profession and Milk Control in Scandinavian Countries."

A symposium on a recent outbreak of equine encephalomyelitis in the state of California, led by Dr. K. F. Meyer, of the Hooper Foundation for Medical Research, concluded the evening's program.

GEO. M. SIMMONS, *Secretary.*

MICHIGAN-OHIO VETERINARY MEDICAL ASSOCIATION

The semi-annual meeting of the Michigan-Ohio Veterinary Medical Association was held at the Court House, Adrian, Michigan, November 20, 1930, with an attendance of twenty-seven veterinarians.

Dr. J. H. Lenfestey, of Lyons, Ohio, gave a very interesting résumé of his European trip the past summer.

Dr. H. Preston Hoskins, secretary of the American Veterinary Medical Association, and Dr. E. T. Hallman, of Michigan State College, spoke on the subject of the relations between veterinarians and the various branches of the agricultural extension service. Dr. Hoskins reported what had been accomplished by the A. V. M. A. Special Committee on Agricultural Extension Service, and Dr. Hallman, who is chairman of a similar committee of the Michigan State Veterinary Medical Association, related the progress made by his committee since its appointment in

June. Both speakers were of the opinion that much good had already been accomplished by these committees, and veterinarians may confidently look to the future for a complete solution of the present problem.

Following the meeting, about twelve of the members took dinner together at a local hotel.

E. C. W. SCHUBEL, *Secretary-Treasurer.*

CENTRAL NEW YORK VETERINARY MEDICAL ASSOCIATION

The twenty-first annual meeting of the Central New York Veterinary Medical Association was held at the Onondaga Hotel, Syracuse, N. Y., November 20, 1930. The meeting opened with a luncheon at the Onondaga, at 12:30 p. m., when a goodly number of the members sat down to a very appetizing lunch, following which we adjourned to a room very nicely arranged for us, and the President, Dr. D. M. Hoyt, called the regular meeting to order. Roll-call showed twenty-five members present.

Dr. D. A. Boardman read a number of resolutions that were adopted at the meeting of the New York State Veterinary Medical Society. One was on poultry radio talks including care and treatment of birds, and another on certificates of registration of spayed bitches.

Dr. W. L. Clark made a motion, seconded by Dr. A. J. Tuxill, that we use our influence to defeat any proposed legislation for an appropriation for extension and research in poultry diseases if sponsored by any organization other than the New York State Veterinary College. Motion carried.

Dr. John K. Bosshart made a motion, seconded by Dr. Geo. W. Derrick, that we, the members of the Central New York Veterinary Medical Association, in regular meeting assembled, do hereby petition the New York State Veterinary College that licensed veterinarians receive the knowledge needed and the same be imparted by sending trained men out to meet groups of veterinarians at convenient points throughout the State at reasonable intervals. Carried. Dr. D. A. Boardman made a motion, seconded by Dr. Clark, that the Chairman appoint a committee to work in connection with the New York State Veterinary Medical Society or any other veterinarians along this line. Carried.

Dr. Clark made a motion that this society hold its meeting in connection with the State Society in Syracuse in the summer of

1931. Carried. Dr. S. R. Wright and Dr. M. F. Wilkinson were elected to membership.

Dr. I. F. Brenning gave a very interesting paper on "Surgery of the Eye (Canine)." Dr. Derrick demonstrated the tube test for abortion. Informal discussions followed on various subjects.

W. B. SWITZER, *Secretary.*

WESTERN NEW YORK VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Western New York Veterinary Medical Association, held at Buffalo, N. Y., December 11, 1930, was one of the most successful meetings in the history of the Association.

The early part of the meeting was devoted to clinics, some twenty cases being disposed of. At four-thirty the business session was called to order by the President, Dr. L. J. Tillou, of East Aurora, N. Y., forty members responding to the roll-call. Routine business was transacted and new members were accepted, followed by the election of officers.

Dr. C. R. Perkins, of the local Bureau of Animal Industry, was made President, Dr. Frank L. Stein, of Rochester, N. Y., Vice-President, and Dr. F. F. Fehr, of Buffalo, N. Y., was reelected Secretary-Treasurer.

A banquet was later enjoyed by the members, their families and guests, during which Dr. E. L. Volgenau, of Buffalo, gave a vivid account of his trip this past summer with the American veterinarians attending the International Veterinary Congress, held in London, England.

The evening session was resumed in the S. P. C. A. Hall.

President Perkins introduced Dr. E. A. Cahill, president of the Allied Laboratories, Chicago, Ill., who presented a very interesting paper on canine distemper, evoking a lengthy discussion in which most of the members participated.

Dr. R. C. terKuile, of Rochester, N. Y., then gave a paper on Hodgkin's disease, which, while technical, was well given and aroused considerable discussion, as did also a paper on jurisprudence, given by Dr. R. J. Wilkinson, of Kenmore, N. Y.

With the presentation of several case reports and specimens, the meeting came to a close and all seemed unanimous in voting this the best meeting we have had.

F. F. FEHR, *Secretary-Treasurer.*

NECROLOGY

ROBERT VANS AGNEW

Col. Robert Vans Agnew, U. S. Army, retired, died as the result of an automobile accident near Jonesboro, Ga., November 13, 1930.

Born in Nollore, India, May 28, 1865, Col. Vans Agnew received his veterinary training at the Ontario Veterinary College and was graduated with the class of 1895. He served as veterinarian in the federal service from April 24, 1902, to April 5, 1917. He accepted an appointment as Army veterinarian April 6, 1917. He was made a major in the Veterinary Corps of the National Army, November 17, 1917. He was promoted to the rank of Lieutenant Colonel, May 12, 1919, and honorably discharged June 30, 1920. He was made a major in the Veterinary Corps of the Regular Army, June 4, 1920, and promoted to the rank of Lieutenant Colonel, December 18, 1920, to the rank of Colonel, December 18, 1926, and retired by operation of the law, May 28, 1929, his last station being Fort McPherson, Ga.

Col. Vans Agnew joined the A. V. M. A. in 1913. Most of his military service was spent as veterinarian with the Cavalry. He saw service in the Philippines, on the Mexican Border, and in France during the World War.

LOGAN A. WHITE

Dr. Logan A. White, of Chicago, Illinois, died October 31, 1930. Death resulted from acute lymphatic leukemia, his final illness being of short duration, although he had not been in his usual robust health for several months.

Born at Paton, Iowa, Dr. White secured his veterinary education at Iowa State College. He was graduated with the class of 1914. He practiced at Sioux Rapids, Iowa, Turtle Lake, Wis., and Parkersburg, Iowa. In 1923 he entered the service of the

U. S. Bureau of Animal Industry and was stationed at South Saint Paul, Minn. Later he was transferred to Chicago.

Dr. White joined the A. V. M. A. in 1915. He is survived by his widow, one son and one daughter.

LESLIE ALLYN WRIGHT

Dr. L. A. Wright, formerly of Columbus, Wis., died suddenly while visiting friends at South Orange, N. J., November 23, 1930. Heart trouble was given as the cause of death.

Born at Medina, Ohio, December 15, 1863, Dr. Wright immigrated to Wisconsin, with his parents, in a covered wagon. He attended local schools and then entered the Ontario Veterinary College. He was graduated with the class of 1890 as gold medalist.

Dr. Wright joined the A. V. M. A. in 1909. He served as secretary of the section on General Practice, 1924-1925. He was

DR. L. A. WRIGHT

a member of the first Wisconsin State Board of Veterinary Examiners and served the Board as President during his first term. He held Wisconsin Veterinary License No. 2. He was a member of the Wisconsin Veterinary Medical Association and held various offices and committee assignments during the time of his active membership. He was a member of the U. S. Live Stock Sanitary Association.

At one time Dr. Wright was a member of the Republican State Central Committee and he attended two Republican conventions

(1904 and 1908) as a delegate. He was vice-president and a director of the Farmers and Merchants Bank, of Columbus. During the late war Dr. Wright was a member of the Columbia County Draft Board and for a number of years he was president of the Columbus Board of Education. He was a member of the Masonic Order, the Knights of Pythias and the Rotary Club of Columbus.

During recent years Dr. Wright had not been in active practice, but had been conducting a fox-farm at Chester Hill, N. J. He is survived by his widow, one son, one daughter, four brothers and two sisters. Funeral services were held at Columbus, November 26.

CHARLES A. STEVENSON

Dr. Charles A. Stevenson, of Hodgson, Man., passed away at the General Hospital, Winnipeg, Man., November 14, 1930, at the age of 62. Born in Scotland, Dr. Stevenson came to Manitoba in 1884, He was a graduate of the Ontario Veterinary College, class of 1898. He practiced for a number of years at Reston, Man., was a captain in the Veterinary Corps of the Canadian Army during the Great War, and for the past three years engaged in general practice at Hodgson. He also was Indian Agent at that point. Dr. Stevenson is survived by his widow, two sons and three daughters.

L. E. MILLER

Dr. L. E. Miller, of Corpus Christi, Texas, died November 2, 1930, following an illness of several weeks.

Born near Columbus, Ohio, April 11, 1889, Dr. Miller attended local grade and high schools and then entered Ohio State University. He was graduated with the class of 1912. He served as first lieutenant in the 16th Cavalry during the late war and was stationed at Camp Greenleaf, Ga., Camp San Benito, Texas, and Fort Sam Houston, Texas, as well as seeing service in France. He established a general practice at Corpus Christi after the war.

Dr. Miller joined the A. V. M. A. in 1918. He is survived by his widow, one son, his father and one brother.

GEORGE PUGH

Dr. George Pugh, of Lawton, Okla., died at his home November 21, 1930, after a very brief illness. Death was ascribed to heart disease.

Born in 1872, at Indianola, Iowa, Dr. Pugh removed to Oklahoma in 1900. He settled in Lawton and remained there until the time of his death. He secured his veterinary education at the Western Veterinary College, Kansas City, and was graduated with the class of 1907.

Dr. Pugh was a charter member of the Oklahoma State Veterinary Medical Association and served the organization as President during the year 1928. He was a highly respected citizen in his community and a leader in church and civic affairs during his entire career in Lawton. He is survived by his widow, one son, one daughter, one brother and four sisters.

FELIX HAROLD BESCOBY

Dr. F. H. Bescoby, of Los Angeles, Calif., died December 8, 1930, following an operation for gall-stones.

Born in London, England, April 18, 1884, Dr. Bescoby studied veterinary medicine at the Ontario Veterinary College. He was graduated in 1919 and at the time of his death was in practice in Los Angeles.

Dr. Bescoby joined the A. V. M. A. in 1926. His other professional affiliations included the Los Angeles Veterinary Association and the Southern California Veterinary Medical Association. He is survived by his widow (née Maude Lamb), one son and one daughter.

JOHN H. ROBERTS

Dr. John H. Roberts, of Northampton, Mass., died at his home, December 11, 1930. Pneumonia was the cause of death. Dr. Roberts was a native of Quebec and a graduate of the Montreal Veterinary College, class of 1888. He had been a resident of Northampton for forty years and was a former neighbor of ex-President Coolidge.

Dr. Roberts joined the A. V. M. A. in 1903. He was district agent for the Massachusetts Department of Animal Industry.

SAMUEL M. MIZER

Dr. Samuel M. Mizer, of Leslie, Mich., was instantly killed while hunting near Mason, Mich., December 14, 1930. The accident occurred when Dr. Mizer dragged his rifle through a fence and the gun discharged, inflicting a fatal abdominal wound. Dr. Mizer was a graduate of the Ontario Veterinary College, class of 1901.

WILLIAM A. PAULSON

Dr. William A. Paulson, of Reasnor, Iowa, died October 30, 1930. He was a graduate of Iowa State College, class of 1919. He was a member of the Iowa Veterinary Medical Association.

C. H. GIESEKE

Dr. C. H. Gieseke, of New Ulm, Minn., died at his home, October 27, 1930, after a lingering illness. He was a graduate of the Chicago Veterinary College, class of 1917, and was a member of the Minnesota State Veterinary Medical Association.

C. E. UNDERWOOD

Dr. C. E. Underwood, of Oakfield, Wis., died at his home, December 6, 1930, after an illness of several weeks. He was a registered non-graduate practitioner and held Wisconsin License 340. He was born in Hustisford, Wis., June 13, 1863, and had been located at Oakfield for 33 years.

PERSONALS

BIRTHS

To Dr. and Mrs. Thos. P. Bett, of Guelph, Ont., a daughter, Margaret Patricia, October 23, 1930.

PERSONALS

Dr. F. A. Bonnstetter (Iowa '24) has removed from Algona, Iowa, to Wesley, Iowa.

Dr. C. H. Horstman (Iowa '30) has removed from Jackson, Minn., to Reasnor, Iowa.

Dr. Peter Garside (Chi. '10), of Bourbon, Indiana, is wintering at Daytona Beach, Fla.

Dr. I. W. Perry (Chi. '17), formerly of Sterling, Ill., is now located at Tampico, Ill.

Dr. Guy S. Jones (Iowa '17) has changed locations, from Lohrville to Audubon, Iowa.

Dr. Clyde Dohner (Ont. '28), formerly of Detroit, Mich., has opened an office at Reedsburg, Wis.

Dr. Richard M. Parry (U. P. '30), formerly of Lewistown, Pa., is now located at Duncannon, Pa.

Dr. C. E. Long (K. S. A. C. '17), formerly of Blue Mound, Kans., is now located at Independence, Ore.

Dr. E. L. Wilson (Corn. '12), formerly of Glen Rock, N. J., is now at 15 N. Pleasant Ave., Ridgewood, N. J.

Dr. E. J. R. Bates (Mich. '25), formerly of Chesaning, Mich., has located at Merrill, Mich., for general practice.

Dr. G. P. Mayer (Chi. '16), recently of Manistee, Mich., is spending the winter in California with his family.

Dr. A. F. Nelson (Ind. '01-Chi. '02), of Thorntown, Ind., will represent Boone County in the 1931 Legislature.

Dr. George E. Clancy (Gr. Rap. '04) has sold his 230-acre farm, near Eden, Mich., and has returned to Scottville, Mich.

Dr. C. R. Blatchford (Mich. '26), formerly of Flint, Mich., has removed to Battle Creek, Mich. Address: 180 Lake Ave.

Dr. Sam Crouch (McK. '20) has removed from Glendale, Calif., to South Pasadena, Calif. Address: 303 Pasadena Ave.

Dr. S. A. Watters (K. C. V. C. '08) has removed from Guthrie, Okla., to Norman, Okla. Address: 205 W. Comanche St.

Dr. J. S. Donald (Ont. '86), of Bay City, Mich., was confined to his bed most of the month of December, due to serious illness.

Dr. H. P. Heinlen (Gr. Rap. '13), who was in practice at Dowagiac, Mich., for seventeen years, has removed to Buchanan, Mich.

Dr. C. J. Cooper (Ont. '02) has been appointed Government Veterinary Officer for Bermuda, with headquarters at Hamilton.

Dr. H. F. Keagy (Colo. '30) is operating the Beverly Hills Small Animal Sanitarium, at 351 Foothill Rd., Beverly Hills, Calif.

Dr. Roy W. Elrod (Ind. '10) reports a change of address from Crothersville, Ind., to Seymour, Ind. Address: 523 S. Chestnut St.

Dr. J. L. Ruble (San. Fran. '15), formerly of Quitman, Ga., has removed to Orlando, Fla., where he has opened a small-animal hospital.

Dr. T. A. Sigler (Ind. '02), of Greencastle, Ind., was chairman of the Putnam County (Ind.) Christmas Seal Committee for the 1930 campaign.

Dr. J. E. Greer (K. S. A. C. '25), formerly of Lexington, Miss., is now located at Mayfield, Ky., with the Pet Milk Company, of Saint Louis, Mo.

Dr. E. C. Goodrich (Gr. Rap. '15), of Kalamazoo, Mich., is spending the winter in Tampa, Fla., on account of the poor health of Mrs. Goodrich.

Dr. E. E. Bittles (Ont. '90), of Waterford, Pa., accompanied by Mrs. Bittles, is spending the winter in Miami, Florida, for the third consecutive year.

Dr. E. B. Topmiller (McK. '12), formerly of Murfreesboro, Tenn., has moved to Columbia, Tenn., and has opened an office at the stock-yards.

Dr. Roy Speck (O. S. U. '25), of Pendleton, Ind., has purchased the interest of Dr. E. W. Fry in the Smith and Fry Veterinary Hospital, at Anderson, Ind.

New Hill Memorial Library
Louisiana State University

Dr. J. P. Clark (K. C. V. C. '18) has removed from Keokuk, Iowa, to Pleasant Hill, Mo. Dr. Clark writes that Missouri is plenty good enough for him.

Dr. Hans Pedersen (Royal, Denmark '27), formerly of Kansas City, Mo., is now with the Public Health Department, Municipal Council, Shanghai, China.

Dr. W. J. Hayes (McK. '18), who practiced at Crosby, N. Dak., for about twelve years, has removed to Ridgeland, Wis., and will specialize in the diseases of dairy cattle.

Dr. Frank C. Tucker (McK. '09), of Claypool, Ind., was elected president of the Northeastern Indiana Veterinary Association, at the meeting held in Fort Wayne, December 9, 1930.

Dr. J. R. Martell (Ont. '28), of Flint, Mich., addressed the Northeastern Rabbit and Cavy Breeders Association at the regular meeting held at the Court House, at Flint, November 18.

Dr. N. D. Cash (K. S. A. C. '25), of Santa Ana, Calif., recently completed a new small-animal hospital, at 1614 S. Main St. The kennels have floors and sidewalls constructed of pressed wood.

Dr. J. F. Kagy (U. S. C. V. S. '18), of Kingsport, Tenn., was elected president of the East Tennessee Veterinary Association, at the annual meeting held in Knoxville, December 13, 1930.

Dr. G. F. Tottman (Chi. '08), who has been located in the Philippines for a number of years, is taking a winter vacation in Australia. He expects to return to the United States in the course of a few months.

Dr. Hugh F. Arundel (Cin. '19), of Statesboro, Ga., has purchased the practice and hospital of Dr. J. L. Ruble (San Fran. '15), at Quitman, Ga. The property includes a seventeen-acre pecan grove adjoining the hospital.

Dr. W. N. Armstrong (Ont. '94), of Concord, Mich., was elected a member of the Executive Board of the Jackson Council, Boy Scouts of America, at the annual meeting of the organization, held in Jackson, Mich., recently.

Dr. Allen E. Fogle (O. S. U. '10), formerly field veterinarian for the Ohio State Division of Animal Industry, has formed a partnership with Dr. Fred Sharp (O. S. U. '11), of Worthington, Ohio, to engage in general practice.

Dr. Ching Sheng Lo (K. S. A. C. '23) has been transferred from Shanghai, China, to Hankow, China, with the Hankow Bureau of Inspection & Testing of Commercial Commodities, of the Ministry of Industry, Commerce and Labor.

Dr. M. J. Huggins (Chi. '13), of Edwardsville, Ill., addressed the Chamber of Commerce, at Highland, Ill., recently, on the subject of "Safety Standards in the Production and Consumption of Milk." Dr. Huggins is Madison County veterinarian.

Dr. P. H. Sager (Chi. '16), until recently a partner of Dr. R. K. O'Neil (Corn. '27), operating the Grosse Pointe Small Animal Hospital, at Grosse Pointe Park, Mich., after a three-months attack of whooping-cough, is now confined in a tuberculosis sanatorium at Custer, S. Dak.